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The Use of Native Woods for Interior Finish.

PART II.

By C. MATLACK PRICE.

BECAUSE of the number of woods discussed in this article, it is obviously necessary to treat of each with a minimum of data which will present a maximum of information, nor has it seemed of value to divide them into "hardwoods" and "softwoods," since these designations are largely arbitrary. In each case the points of salient interest to the architect are the physical properties of the wood, — its appearance, the finishes to which it is best suited, its uses, and its comparative cost.

Hall in House at Charles River Village, Mass.
Richardson, Barott & Richardson, Architects

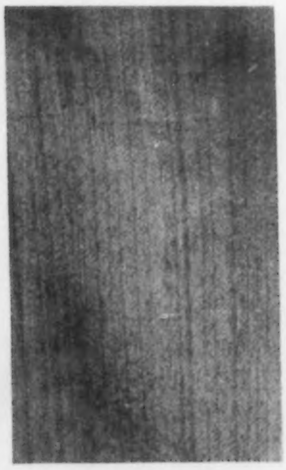
BIRCH.

AN important wood, possessing structural value as well as the finished appearance necessary for interior trim, is birch. Woodsmen distinguish the two principal species of this tree as sweet birch and yellow birch, the two being distinct in the woods, but so nearly identical after they have been milled that only expert scrutiny with a microscope could tell one from the other. The marketed article, therefore, called "birch," may be either sweet or yellow birch — as often as not the manufacturer himself could not tell you, nor would it be a matter of any consequence.

Birch used to be thought difficult to season and was not much used for that reason in pioneer days. As in the case of red gum, however, this difficulty has been overcome by improved modern dry-kiln methods, and birch is now greatly in favor. It is a heavy, strong, and hard wood, its color a dark or light brown tinged with red, the sapwood light yellowish, the heart darker. In yellow birch the sapwood is often nearly white. The finished wood shows little difference between the spring wood and summer wood, and no figure is obtainable from the medullary rays, which are numerous but very fine and, appearing on the surface, give a kind of satin-like gloss. Comparatively rare specimens are wavy and curly birch, which present richly diversified figure and take fine finishes. The wood known as red birch, very beautiful and highly considered,

Plain Sawed Birch

Library in House at Charles River Village, Mass.
Richardson, Barott & Richardson, Architects
Walls, ceiling, and doors of this room and ceiling of hall shown above are of birch, stained, waxed, and rubbed.

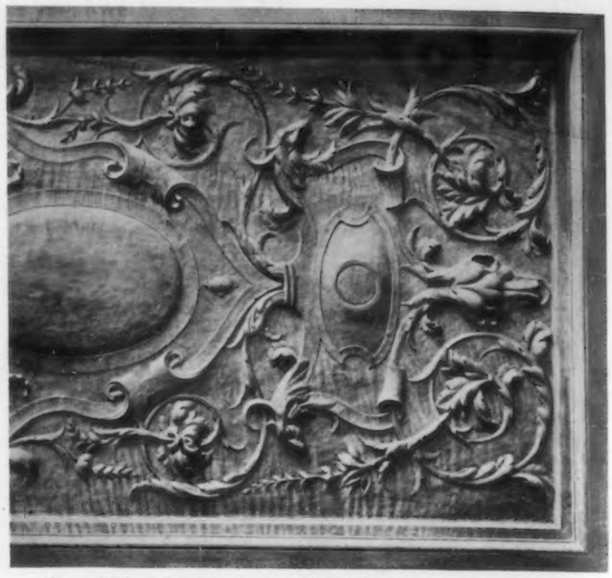


Quarter Sawed Birch

is the heartwood of selected yellow birch lumber.

Birch is excellently adapted for finishing, taking a high, glossy polish, or a dead, "natural" effect equally well. It is a close grained wood requiring no filler, and its fine, compact surface makes it a perfect base for enamel or paint. It is readily stained to resemble walnut, and its pleasing grain makes light, transparent stains very popular. It has been successfully finished in "mission" brown, gray, dark and light green, and to imitate bog oak, fumed oak, walnut, mahogany, Circassian walnut, and cherry. When substituted for cherry and mahogany, it is sometimes called "cherry birch" or "mahogany birch."

American Black Walnut
Illustration is ½ Actual Width of Specimen



Carved Black Walnut Ceiling Panel, New York Public Library
Carrere & Hastings, Architects

Broadly speaking, there are three kinds of stains: spirit, oil, and water stains, and these produce different results on different woods. In the first, the pigment is held in solution in alcohol; in the second, in oil; in the third, in acid. Owing to the rapid evaporation of spirit stains while applying, they are not recommended for birch. Better results are obtained with oil stains, though these are not so clear and transparent as water or acid stains when applied to birch, for the latter may be quickly and evenly applied and allow any kind of last coat finish over them.

Mantel in House of T. H. Newberry, Esq., Grosse Point Farms, Mich.
Trowbridge & Ackerman, Architects
All woodwork and carving of butternut, finished with stain, waxed, and rubbed, producing a dull gloss

The toughness and density of birch as well as its appearance make it a good flooring material, it being considered, indeed, as serviceable as oak in this respect, for its closely interwoven fibers resist wear and do not splinter. In its wearing qualities and its hard and smooth properties, birch is as good a flooring material as maple, the latter differing only in its whiteness. Birch flooring is a strong competitor with maple, and is made into tongued-and-grooved stock and also parquet flooring, while its strength causes its frequent use in stairwork. A great many doors and much moulded and flat trim are made of birch, as well as built-up panels and veneering, and it is well adapted for built-in furniture to match trim.

With all its fitness for interior finish, both structural and ornamental, birch is a very poor wood to expose to weather, which, however, need not concern us in a study of interior finish — besides which few woods can serve every purpose well, and few, even, can serve as many interior uses as birch.

BLACK WALNUT.

THERE seems to be a generally prevalent idea that American black walnut is virtually extinct; the fact, however, being that much is still being turned out of the mills. It is nevertheless true that black walnut is certainly scarcer and more expensive than in the early days when farmers split it for rail fences and used it for firewood.

Butternut Mantel in House at Hadlyme, Conn.
Charles A. Platt, Architect

Plain Sawed Butternut
Illustration is ¼ Actual Width of Specimen

BUTTERNUT.

THIS is a wood of fairly wide use, but never appears in great quantity. The annual cut for milling is given as about a million feet. Butternut is very closely related to black walnut, both botanically and in its habitat, growing wherever black walnut is found, and sometimes called "white walnut" for distinction.

In some states it is largely used for flooring and ceiling, in others for cabinet-work, furniture, and mouldings. Being very similar to black walnut, its working is about the same, though in finishing it will not take so high a polish, and often requires a filler. A plank containing both heartwood and sapwood will show a difference in this respect, because the natural pores of the wood are larger and more numerous in the wood of older growth.

The greatest drain on stands of black walnut in the South came between 1860 and 1880, when enormous quantities were used for the construction of the massive and hideous furniture of the period.

The tree grows quickly, and since the extensive demand and cut of thirty years ago much good black walnut timber has had a chance to grow. Since only the dark colored heartwood is valuable, and this exists only in old trees, it is obviously a tree whose value increases with age.

Black walnut is esteemed for its rich color, its figure, and the high polish it will take. Its grain permits as well of intricate carving. The medullary rays in this wood are not visible without a microscope, so that the figure results from the formation of the annual rings.

Black walnut is now being used again for the manufacture of furniture, but of a very different kind of furniture from that of the 1860–1880 period. We now see "American walnut" as the wood-specification of beautiful suites of William and Mary and Cromwellian furniture — masterpieces of the designer's and cabinet-maker's art. Much of the wood is exported, much is cut for veneer, but none is ever used in these days as rough lumber.

Black walnut, having an open grain, requires a filler in finishing, and by reason of its dark, natural color requires little or no pigment — and it is not to be considered that any one would want to paint it. A paneled wainscot, or a ceiling of black walnut, would obviously be far from cheap, though peculiarly rich, especially with a touch of dull gold on the carving — it has been the intention here merely to call attention to the fact that American black walnut is by no means extinct. It is in fact to-day having a wide use apart from interior finish and furniture as gun stocks for the European armies.

A black walnut stain on *birch* is considered the closest imitation in another wood, though red gum often successfully masquerades as black walnut.

Library in House of Louis J. Pooler, Esq., Tuxedo, N. Y.
Charles A. Platt, Architect
The ceiling is of butternut, finished natural with decorative painting in colors

The interesting figures which it is possible to obtain in butternut are not resultant from medullary rays, but from narrow black lines which define each of the annual rings. This quality has led many architects to experiment with it, resulting in their obtaining a number of interesting effects. It readily adapts itself to carving because its grain is not too hard and is of an even quality. The mantel by Trowbridge & Ackerman and the ceiling by Charles A. Platt, illustrated herewith, show excellent uses of the wood.

White Ash Dining Room in House at Chestnut Hill, Mass.
Chapman & Frazer, Architects

WHITE ASH.

THIS wood might be better known, perhaps, as "native ash," since it is variously called "white," "brown," "black," and "southern green" ash. While it has uses far more important and peculiar than interior finish, many striking results have been obtained by its use in this connection. Physically it is an extremely hard wood to work, borings for nail holes being very advisable, and even with this aid experienced carpenters "soap" thin nails. Naturally, it is very hard on edged tools and saws, and the reward for its use lies only in its striking figure and its interesting texture when finished "natural." White ash is not quarter sawed, because its figure results not from medullary rays, like oak, but from the marked contrast between springwood and summerwood in the rings of annual growth. It is a heavy, strong, elastic, and very hard wood, which makes it peculiarly valuable as a material for wheel-spokes, ores, ax-handles, and the like.

Plain Sawed White Ash

Plain Sawed Chestnut

These Illustrations are ⅕ Actual Width of Specimens

A good deal of ash has been used in the manufacture of "mission" furniture, as it takes stains and fuming excellently, with enough texture of its own to require no high finishes. The finish of the ash dining room illustrated herewith was obtained by a black stain and a coat of wax rubbed down.

Chestnut Paneled Room, Tennis Court Building, Payne Whitney Estate, Manhasset, N.Y.
T. Marcoe Robertson, Architect

CHESTNUT.

THIS wood exists in three species in the United States, and is chiefly used in the manufacture of furniture and interior finish. It is a comparatively coarse grained wood, and its pronounced figure is due to the formation of the annual rings, with their disposition of springwood and summerwood. In the matter of finish its open grain requires a filler, and where stained or rubbed effects are desired, chestnut may be considerably improved by rubbing pigment into the grain. Ammonia fuming has a pronounced effect on chestnut, which has made it a wood extensively used in "mission" furniture and woodwork where such effects are desirable. Its bold figure makes it most suitable when used for large, simple surfaces without elaborate mouldings.

Modern German Architecture.*

PART II.

By IRVING K. POND.

VERY possibly a good workman can produce good work with indifferent tools, but it will be difficult to demonstrate that a fine idea can be well expressed by an indifferent workman. There is no indication on the surface that German architecture suffers from inexperienced or careless craftsmen; there is every indication that the thought of the German architect finds sympathetic lodgment in the mind of a trained and sympathetic executioner, be he artist, artisan, or mechanic. It is easy to comprehend that the total effect will be unity when the designer and the craftsman are of the same mind, race, and temperament. And when the races, diversified once, are bound into a national unity as they now are in Germany, surely we may expect to find an unconfused national utterance as we there do. The artist *thinks* German, the craftsman *does* German—both are definitely and with design trained in that thought and act. The state sees to that. Can the mind grasp the possible wonders of an American art when the American artist *conceives* America, and the American craftsman *makes* the conception concrete for the love of an America which does not impose itself upon its citizens, but which is the ultimate and communal expression of individual life and idealism!

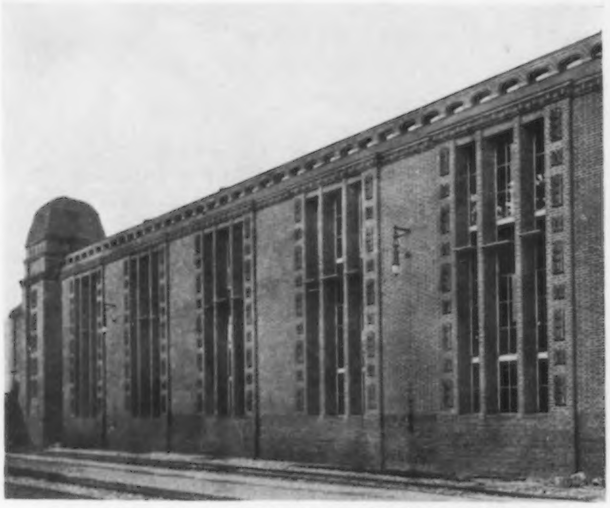
Savings Bank, Aarau, Switzerland
Curjel & Moser, Architects

Director's Residence, Building Trades School, Essen-Ruhr
Edmund Korner, Architect

Building Trades School, Essen-Ruhr
Edmund Korner, Architect

But as to the German craftsman: metal, wood, stone, textiles, color, all testify as to his skill and comprehension. In the seemingly slight matter of staining the wood the beauty is more than skin deep, for the color is made to penetrate the fiber throughout so that the texture and the color may be unified and harmonious when the wood is carved and otherwise worked. The frequent, almost general, use of marquetry and inlay in rich color and intricate design strikes the outsider as extraordinary. In many another country the cost would be prohibitive were designers and craftsmen forthcoming. Quite remarkably there is very little crudity of color appearing in the stained wood. Often the color is vivid, but then it is held down in area. Sometimes an intense color covers a large field, but there always is provided a relief when the effect seems about to become overpowering. Domestic interiors swim in color, while the churches and the festal chambers of the town halls and the halls given over to public recreation and refreshment are sometimes almost barbaric in the richness of their color decoration. In all this, harmony reigns. The people are speaking their primitive nature in a forceful, well understood, and finely modulated language. It matters not that forms and colors shock the eyes of the unsympathetic alien. They are for and of the Germans, expressive of the German self, and so are exemplars of vital art; and vital art after all, if not the only real art, is the only art for men of red blood and real convictions. To bring it home, would not

*NOTE. The illustrations accompanying these papers, excepting those on page 246, are reproduced from *Moderne Bauformen*, published in Stuttgart. I offer my sincere thanks to the publishers of that valuable journal. — *I. K. P.*



Power House, Hamburg Elevated and Underground Railway
Emil Schaudt, Architect

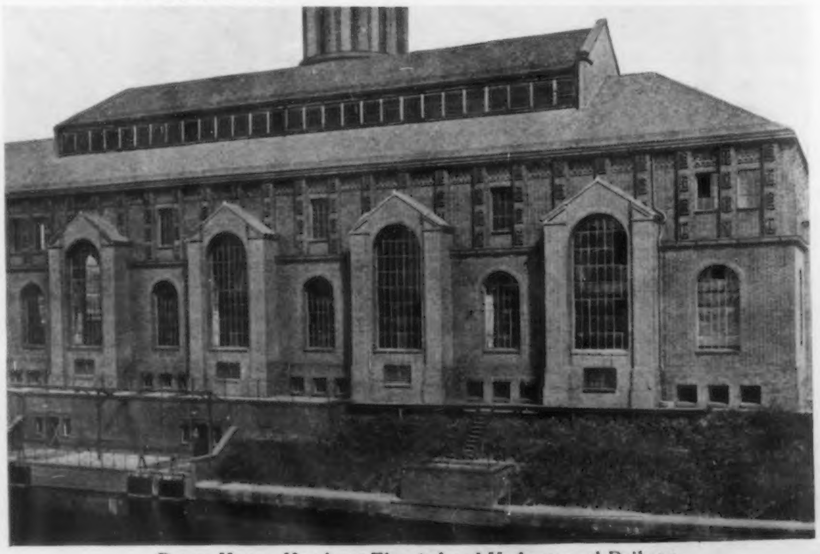
these characteristics from our own standpoint. The qualities of grace and charm which can come only from long and intimate use of characteristic forms by minds imbued with those qualities I, confessing my limitations, fail to discover in much, if not all, of the modern German architecture; but I do sense the power, strength, boldness, and virility which are more necessary of recognition and embodiment when one is looking life squarely in the face and going back to first principles to make a new start in self-expression. Do not mistake the premises. German art is not a blind return to traditions, but a conscious expression of will to analyze and understand self and give that self-understanding and self-analysis concrete æsthetic embodiment in the richest terms. That is one of the lessons of German architecture for the rest of us.

Modern German architecture is in the making. It is not a finished product. Present conditions make attempts at prophecy futile; but if Germany emerges from the conflict freed from that militaristic domination which she has permitted herself to have imposed upon her, she will develop marvelously and even more rapidly along the lines which are so apparent in her modern expression. There has not been as much of feudal expression in German civil architecture during the past decade as there has been in the scholastic and religious architecture of more than one nation I could mention which has not had to bear the burden of Germany's traditions and the heavy hand of military autocracy. A strong social consciousness has made itself manifest in the arts, the spirit, as I have already said, of an awakening social democracy which was not content to express itself in the terms of feudalism or of an effete aristocracy. This manifestation has been regarded unfavorably by certain

Station, Hamburg Railway
Emil Schaudt, Architect

you, neighbor, rather run the risk of having the red now and then a bit too red, and the blue now and then a bit too blue, than to fall back on the negative virtue of blameless white when your soul was thirsting for color? The use of white is more frequently than otherwise a confession of inability and mental inertia, and the weakness thus confessed is not much mitigated by the introduction of washed-out tones and neutral grays. If one's blood is really swarming with white corpuscles to the exclusion of all others, he is justified in seeking to give expression to himself in white. All the eternal verities ask is that a man or a race examine its blood under the microscope and follow to its ultimate conclusion the direction thus indicated. All this applies as well to form as to color.

German architecture like German music displays characteristic rhythm and melody; rhythm showing in the form, melody in the color. A succession of concave surfaces appeals to the German mind as embodying strength and refinement; while a similar succession of convex members carries the impression of strength and boldness. This latter is sometimes overdone to our notion; but again I must remind the critics that we are not Germans and have no desire to be (and, moreover, have no desire to make the Germans like unto us), and that instead of decrying their mode of expression, it behooves us to seek forms just as expressive of our state of mind in the presence of strength or power or boldness, and equally interpretative of

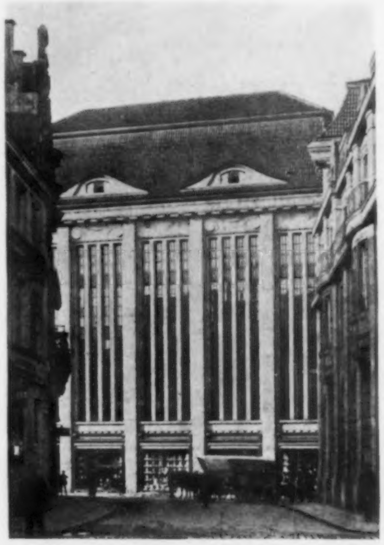


Power House, Hamburg Elevated and Underground Railway
Emil Schaudt, Architect

shallow critics, who know nothing of architecture as an ethnic expression, but regard it merely as an academic problem in the æsthetic combination of archeological forms. The newer and characteristic forms appear in all branches of architectural design, commercial, domestic, civic, etc., showing that they respond to some definite, general impulse.

The solution of the exterior in much of the domestic work is not satisfying to one who has felt the beauty of many of the interiors. But some of the domestic exteriors have approached as near to the borders of perfection as it is given to individual expression to come; and when I contemplate our own efforts in the same direction, I am minded to temper my criticism of alien and foreign work generally. Does a lesson in commercial architecture come to us from the nation which has built up the greatest commercial and industrial system of recent years? In Germany the stores are made architecturally attractive — I may as well say beautiful, for so many of them are. One could as well be attracted by the store as by the merchandise. I hardly have need to mention by name the great department store in Düsseldorf and the Leipziger Strasse department stores in Berlin. Those who have seen them well appreciate that they function perfectly, and that the function has received expression in the architectural treatment of the exteriors. The great halls for the display of carpets and tapestries, the restaurants and rest rooms, are all differentiated and defined in the architectural composition. And the piers start from the ground, giving the building a base. There are great stores not far from where I sit which have not an æsthetic nor apparently a structural leg to stand on. A new bank building in Vienna appeals to me as everything which a bank should be — not a pseudo-Roman temple, but a strong, simple, rhythmical modern expression. The railway station in Leipzig is after the same sort.

Knopf Department Store, Karlsruhe
Wilhelm Kreis, Architect



Althoff Department Store, Dusseldorf
Wilhelm Kreis, Architect

Decoration on these buildings is sparingly and judiciously used. There is a general tendency towards the use of sculptural decoration. The sculptor has affiliated himself with the architect, has entered into the spirit of the structure, and made his work an integral part and not an extraneous thing "stuck on." The piers which shoot in unbroken line from ground to cornice are crowned with sculpture, marking the transition in rich light and shade and creating an interest far beyond any which can inhere in conventional foliage however beautifully wrought. Sometimes the figures are architectural as well as decorative, though German thought will have to go deeper before the architectural phase is worked out in its fulness. But the sculptured figures are "placed" rightly and that is something in modern art, — yes, in the art of any period. In this matter of correlating the arts of the painter, the sculptor, the designer, and drawing them into the service of architecture, modern German architecture holds another lesson for us.

Power plants and factories along with the higher types have received the closest of study and have been given architectural expression which does not belie their true nature, and which causes them to function for public edification as well as for individual satisfaction and convenience.

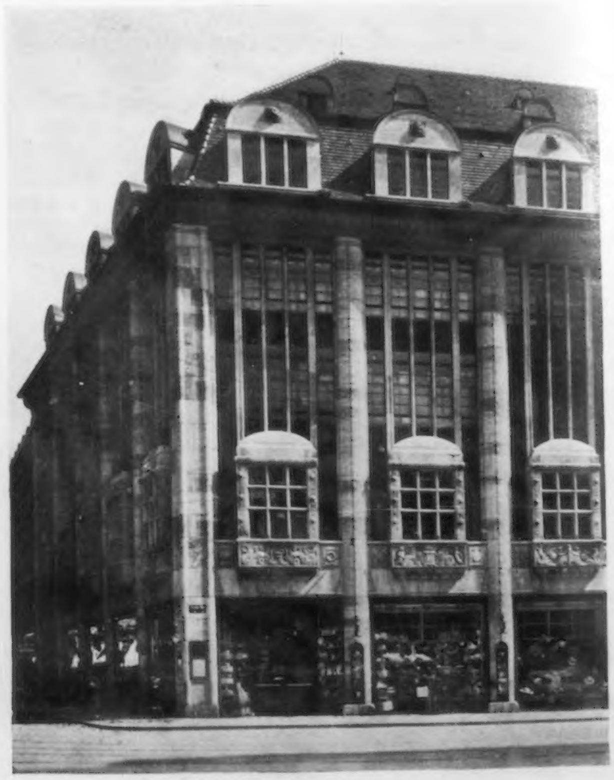
Wertheim Department Store, Berlin
Kayser & Von Grossheim and Ernst Rentsch, Architects

While one expects in these purely commercial and mechanical plants a strength of design, he is not altogether prepared for the unexpected appearance in functional features, such as fire-escape towers, entrances, ventilating cupolas, etc., of a quaintness and an essence almost of charm, probably which we would call charm if we could divest that word somewhat of its conventional application to the forms of the Italian Renaissance. However, quaintness and surprise are ofttimes qualities and characteristics as appropriate and agreeable as is charm. This same characteristic quaintness has always been a heritage of the German people when they were expressing themselves freed from the domination of undigested foreign forms, and this quaintness has always tended to degenerate into grotesqueness — so much so that it would be difficult to convince a critical outsider that there is not at least a slight flavor of the grotesque in the popular German mind. After all, perhaps, grotesqueness is for the most part but the expression of that something in each race and individual which other races and individuals cannot or have not yet learned to understand.

Department Store, Berlin

There is another heritage from the past against which the modern German is struggling — if I read architectural mass and detail rightly. Sentiment long ago degenerated into mere sentimentality, and for ages the love of the "dear God" has been as freely and familiarly invoked to inspire to the enjoyment of the drinking stein as to awaken tender emotions towards the child at Christmas time. God is still held sentimentally as a familiar friend in official circles. But the abstract and more masculine tendency in present-day design indicates that sentimentality is changing into real sentiment. Modern Germany commercially and socially has broken with the past.

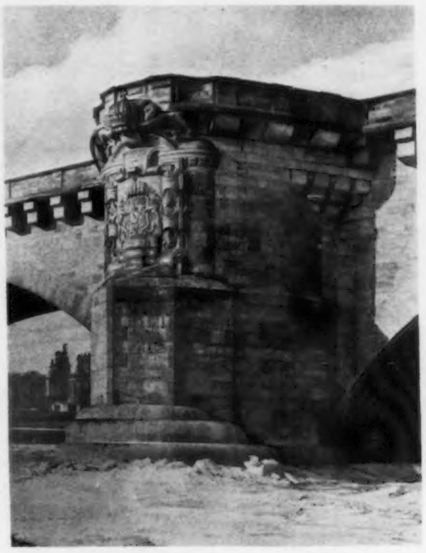
Department Store, Berlin



Department Store, Dresden

But in spite of this one cannot sit in judgment on the Germany of to-day, on her art, on all her forms of self-expression, without taking cognizance of the part tradition is playing because that tradition came up out of the life of the people, and the people cannot change their nature in the twinkling of an eye. The spirit which brought so many free cities into existence in the Middle Ages still breathes. The power which after a time drank up those cities and relieved them of, shall we say, that especial brand of freedom, still moves. Not only does the power move, but it proclaims that it is the one thing for which other things — men, cities, and objects, animate and inanimate — exist. The state is above all. That is autocratic Germany which glorifies war and power and gives itself expression in these national monuments.

The spirit of democratic Germany is breathing in the architecture of the people. It is a spirit which wills to express itself in the face of obstacles, and obstacles enough it has to contend with if only in temperament and traditions. I was led to remark earlier that comparisons are odious; but when I see what individualistic Germany is achieving under a state which proclaims itself superior to the people, I cannot dismiss from my mind America which created her own form of government, flouting political traditions, but which accepted and complaisantly bears the traditions of others in art. What ought not she to accomplish when she makes up her mind to come to herself and divest herself of that which she has borrowed and to appear in her proper person? No state which claims to be all in all dominates her; but she rests in a government of the people, for the people, by the people, which is the apotheosis of the individual and under which and in which the individual may work out his highest salvation.



Detail of Pier, "Friedrich-August" Bridge, Dresden

"Friedrich-August" Bridge, Dresden
Wilhelm Kreis, Architect

The Illumination of the Suburban House.

THE USE OF ELECTRICITY OR ACETYLENE.

By HAROLD L. ALT.

ONE of the most puzzling problems with which the present-day architect is confronted consists of finding a satisfactory means of illumination for high-class country homes which are located within a district supplied with neither electric current nor gas by a service company. It is a fact, and one which will undoubtedly surprise many, that over one-half of the population of the country at the present time is beyond reach of service from any central electric plant, and a much larger proportion is without a gas supply.

Two methods of lighting seem to have given the best satisfaction of all the various expedients tried,—one method being electric lighting from a small isolated plant, and the other acetylene or gasoline gas from an automatic generator.

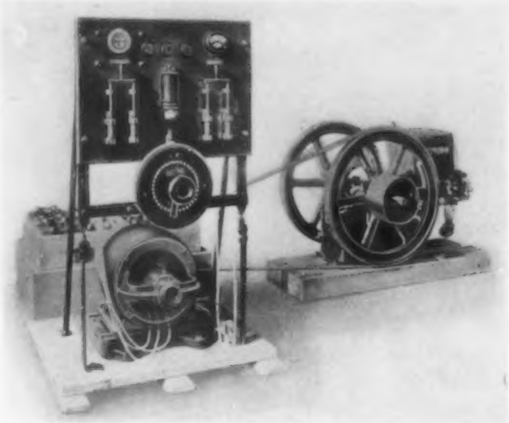


Fig. 1

It is almost superfluous to recite the well known advantages of the electric light, consisting of its brilliant and steady illumination, as well as its absence of smoke, disagreeable odors, and danger from fire. It is the healthiest form of light as it does not consume the oxygen of the air, and the bulbs may be placed anywhere and burned in any position, as is often found necessary for decorative effect. The convenience with which they may be turned on or off from a distant point, if necessary, is also a great advantage, as well as the fact that they will stay lighted when burned out of doors in the heaviest storms and cannot be blown out; still another advantage of installing an electric plant is that the current is available for other purposes such as for fans, sewing and washing machines, or flatirons.

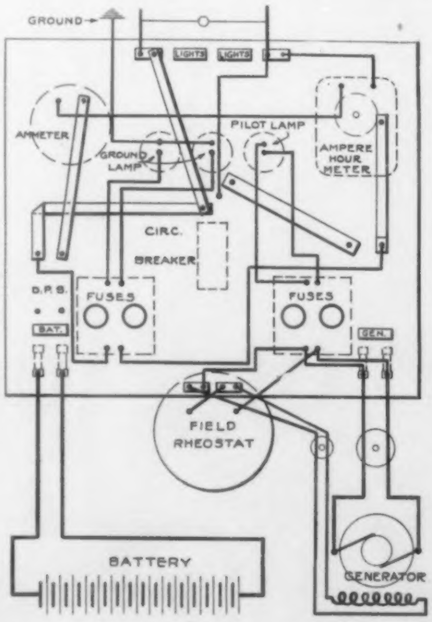


Fig. 2

In some cases it is found that current can be obtained from a central station by extending wires several miles, but the cost of the wires, poles, and insulators would be greater than the cost of a private plant; and, of course, the greater the distance such wires are run, the greater is the possibility of interruption of the service by wind, snow, or sleet breaking the lines during a storm.

The recent placing of the "Mazda" or tungsten lamp on the market with its low current consumption now permits the use of smaller dynamos and engines than were formerly necessary for the same service. With the reduction in the size and capacity of the apparatus, the cost has been correspondingly reduced so that private isolated plants can now be installed in locations which formerly could not afford the rather high initial cost.

The use of engines run by gasoline and kerosene is also growing, especially on account of the automobile, and are being used with increasing frequency on farms and in suburban places for such purposes as pumping water, grinding corn, sawing wood, and separating cream. In practically all cases an engine that is large enough for the other duties will be found more than large enough to run a dynamo for lighting purposes, so that the price of the engine in these cases should be neglected in figuring up the cost of an electric light plant.

While it is quite possible to have electric light with an engine and generator operated without a storage battery, these will supply light only while they are running, and when running they require more or less care and attention. In order that current may be available for use at all times, it is necessary to have a storage battery, and the writer does not believe that any small electric plant can be installed to give satisfaction to the owner without the use of such a battery. The battery has current fed into it when the engine and generator are operating, the lights, while running, being carried by the generator. When not running, the current is taken out of the battery, the length of time the lights will burn from the battery depending on the size and number of the lights and the comparative size of the battery.

In figuring on the size of a plant necessary for any place, the requirements of the heaviest season must be considered. This, in some cases, may call for a battery which will be so large as to be practically idle during the off season; yet this is not objectionable, since a battery which is used little or not at all does not depreciate noticeably. Often a battery will require daily charging during the heavy season and only bi-weekly charging during the light season.

An isolated electric plant may be properly regarded as composed of four parts,— the engine, the generator, the battery, and the switchboard. The gasoline and kerosene engine hardly require description in this article as they are familiar to almost every one.

Regarding the battery, there are two standard types in use for electric lighting; these are termed the "sealed-in" battery in hard rubber jars, which is shipped charged and ready for use from the factory, and the "open" battery in glass jars, which requires setting up and charging.

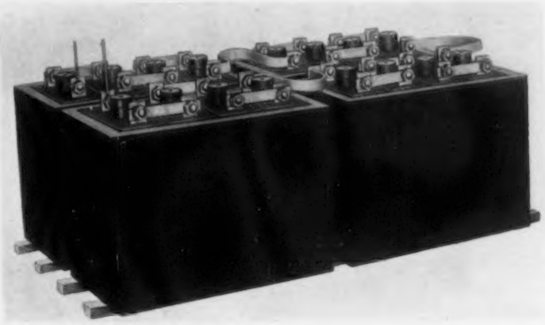


Fig. 3.

Electric lighting systems are usually installed for either of two different voltages,— low voltage plants having 32-volt lamps and high voltage plants 110-volt lamps. One advantage of the 32-volt plant is that only 16 cells of storage battery are needed, each cell giving 2 volts; this decreases somewhat the amount of attention the battery requires. Another advantage is that 32-volt tungsten lamps will stand rough handling better than 110-volt tungsten lamps of the same candle power, as the filaments are thicker and shorter. On the other hand, the 32-volt plant should not be used where most of the lights are more than about 300 feet away from the battery, for the reason that with low voltage the loss of voltage in the wiring between the battery and the lights is too great unless very heavy wire is used at increased expense, and the lamps are liable to burn below their normal brilliancy. The 32-volt plant is, all things being considered, best for small installations with short circuit runs where not more than about 50 lights are in use at any one time.

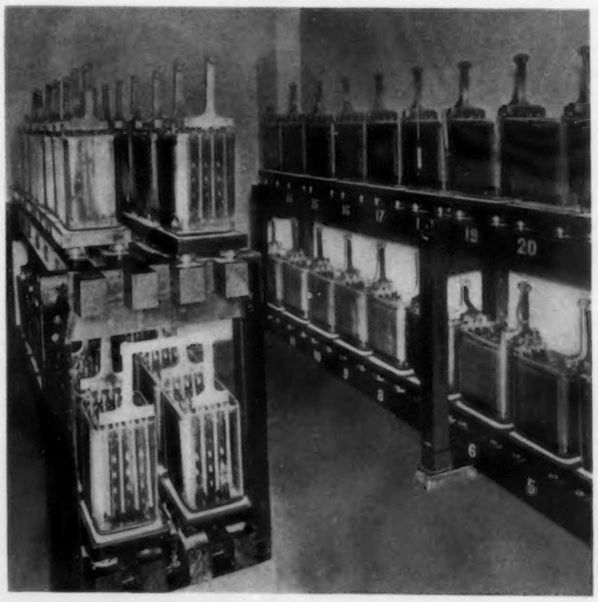


Fig. 4

In 32-volt plants three standard sizes of batteries are used which will carry respectively 9, 15, and 23 16-candle power lamps for eight hours, or a greater number for correspondingly shorter periods. The horse power of the engine required to drive the generator for charging is 3 horse power for the largest size and 2 horse power for the two smaller sizes. The battery, switchboard, and generator are shipped in a single box which is light enough to be handled on an ordinary farm wagon. This equipment is easier to install and put in operation than an ordinary engine or pump.

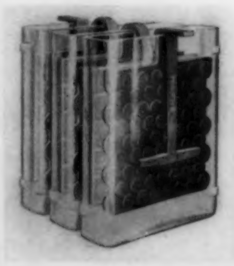


Fig. 5

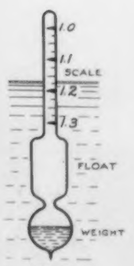


Fig. 6

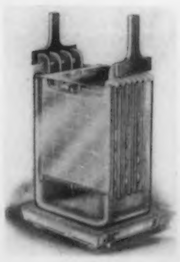


Fig. 7

Referring to Fig. 1, the engine at the left runs the dynamo through the belt, and this generates the electricity which is stored in the battery; the switches and instruments for controlling the electricity are mounted on the switchboard, and the diagram of electrical connections is given in Fig. 2. On the switchboard the meter at the top, to the left, indicates at all times the amount of current taken out of the battery and the amount remaining, thus showing whether the battery needs charging or whether there is enough electricity left in it to light the lamps for another day.

A great advantage of the ampere hour meter is that it shows at what rate charging may be done, permitting the use of relatively high charging rates, and thus shortening very materially the hours of engine operation for battery charging purposes.

The battery consists of 16 hard rubber jars in which are held the battery plates, made principally of lead and lead oxides, the jars being filled with dilute sulphuric acid. A jar complete with plates and electrolyte is called a cell. As indicated in Fig. 3, the cells are placed in wood trays, the various cells being connected to each other and connections being made between trays.

Where the number of lights burned at one time is over about 50, or where most of them are more than 300 feet away from the battery, it is best to install a 110-volt plant. Plants of this voltage include a battery of either 56 cells or 62 cells, the latter number being used where it is essential that the lights should burn at full candle power even with the battery nearly exhausted. With 56 cells only, with 110-volt "Mazda" lamps, the candle power of the lamps will be reduced somewhat towards the end of discharge of the battery. This reduction is not, in most cases, objectionable, when compared with the variable nature of common illumination af-

forded by sunlight and with other forms of artificial lighting.

The engine and generator are essentially the same as for the small 32-volt plant described above, except that they are larger and are usually mounted on a more solid foundation, such as a heavy block of concrete with holding-down bolts embedded in the concrete.

The dynamo may, as in the case of the small plant, be driven by a belt run over one of the engine flywheels and over a pulley on the dynamo, or it may be "direct-connected" to the engine, which arrangement is neater and takes less room. In many cases it is more practical to have a belt-driven dynamo for the reason that the engine may also do other work, and it is not desirable to have the dynamo run every time the engine is operated.

One size of battery for a 110-volt plant is shown in Fig. 4. This battery will carry 82 16-candle power lamps for eight hours and the size of room required to hold it is about 16 feet by 6 feet. The battery plates are hung in glass jars arranged in a manner similar to the hard rubber cells described and resting on sand contained in trays made of glass or wood, these trays being supported on wood racks. The electric current is passed through the cells in the same manner as in the previous case.

A single cell, containing a few more plates and somewhat larger than those of Fig. 4 is shown in Fig. 7, while a 2-plate cell is indicated in Fig. 5.

The electrolyte is a mixture of about one part of sulphuric acid (oil of vitriol) and four and one-half parts of water. When the cell discharges, that is, gives out current for lights, the plates, both positive and negative, absorb some of the sulphuric acid in chemical combination and the electrolyte becomes weaker; when the cell is being charged, that is, receiving current from the dynamo, the sulphuric acid previously taken into the plates is driven out of the plates and back into the electrolyte. Discharging and charging, therefore, weakens and strengthens the electrolyte respectively.

An instrument for measuring the strength of the electrolyte is the hydrometer, which is made of glass, hollow and weighted at the bottom with lead; it is shown in Fig. 6. This floats upright in the electrolyte; where the surface of the electrolyte meets the graduated stem a reading of the strength of the electrolyte is given. The readings of this instrument, therefore, can be used to indicate how much charge there is in the battery.

Glass jar batteries take up more room; they are intended for places where they will not have to be moved about after being set up and where there is little vibration. It is usual to prefer these when there is no objection to the labor of assembling them and giving an initial charge (lasting from 40 to 60 hours) at the time of installation.

There are several types of switchboards available for the 110-volt plant, one used where lights must be main

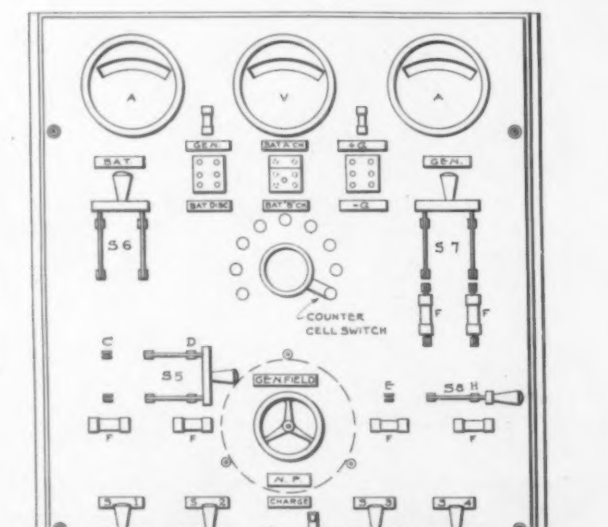


Fig. 8

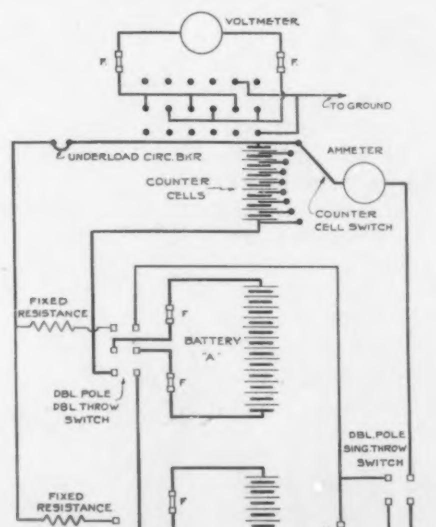


Fig. 9

tained at full candle power being shown in Fig. 8, together with its wiring diagram in Fig. 9. This includes an ammeter A for the generator (and also one for the battery) to measure the electric current and to make sure that the generator is not being overloaded or the battery charged too fast. It includes switches S7 for the generator and for the separate lighting circuits S1, S2, S3, S4, and switches S5 and S8 for shifting the battery from charge to discharge, C and E being charge, and D and H discharge positions. There is also a voltmeter V used for maintaining the current voltage on the lights so that they will not burn too bright or too dim. The voltage is controlled, in the case of the generator, by means of the field rheostat (the hand wheel at the center of the board), and in the case of the battery, by the counter cell switch (in the center of the board) which changes the number of counter cells in circuit. These counter cells are cells which look practically like the other 62 cells of the battery, but have the function of using up excess voltage. The 62 cells give too high a voltage at the beginning of discharge and give about the correct voltage at the end; therefore, most of the counter cells must be in the circuit at the beginning of discharge, and as the discharge progresses, they are disconnected, one by one, by means of the circular counter cell switch. With these connections the battery is charged in two halves, for the reason that the cells require a somewhat higher voltage for charging than they give on discharge, and it is desirable to maintain the voltage on the lamps at 110 while charging.

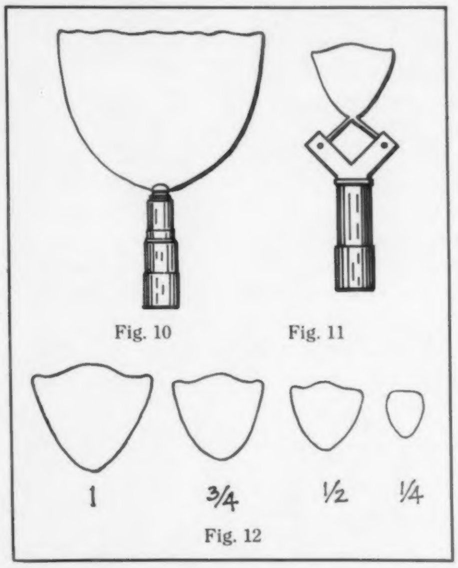


Fig. 10 Fig. 11

Fig. 12

Batteries are much used in country places for summer homes occupied during only three or four months of the year, the batteries standing without attention during the rest of the year, and the fear is sometimes expressed that the electrolyte will freeze and if allowed to remain in the glass jars will break them. Although water will freeze at 32 degrees F., electrolyte of the strength used in batteries, although it contains over 80 per cent, by volume, of water, will not show any sign of freezing until a temperature of about 23 degrees below zero is reached, and then there will be found only a slushy mass of small ice crystals at the top. Electrolyte will not freeze solid even far below this temperature.

Regarding the cost of the fuel consumed by the engines, this is approximately proportional to the amount of power used. At full load a gasoline engine of from 1 to 4 horse power uses from 1 to 1¼ pints of gasoline per horse power per hour. With gasoline at 16 cents per gallon and a consumption of 1¼ pints per horse power per hour, the cost of fuel for electricity for burning a 16-candle power, 20-watt tungsten lamp is about one-tenth of a cent an hour. Kerosene oil engines use cheaper fuel, and the same electricity can be obtained at a cost of less than one-tenth of a cent; but as there is more work involved in starting a kerosene oil engine, the gasoline engine is usually preferred, especially for small sizes.

The cost of electric lighting plants varies with local conditions. An average cost for engine, dynamo, storage battery, and switchboard in 32-volt plants for situations where there are from 15 to 60 lights connected to the circuit, ranges from $360 to $500 for the equipment, f. o. b. maker's works.

The equipment for 110-volt lighting plants will run in cost from about $600 up for engine, dynamo, storage battery, and switchboard, depending on the number of lights to be taken care of and local conditions.

In addition to the cost of the equipment for the electric lighting plant, there will be the cost for wiring the buildings, the cost of the electric fixtures and the lamps, the cost of installing the plant equipment, and the wiring between the plant and the buildings. In the 32-volt plants described above the cost of installing the plant apparatus is practically eliminated, due to the fact that it is shipped from the factory mounted on skids, ready for service.

In localities where a gas engine is impracticable, a simple solution, as far as mechanical operation is concerned, is found in acetylene gas.

There is a strong prejudice which seems to be more or less generally prevalent against the use of acetylene gas generators in the home. It is a fact to be regretted that this is so, and, worse still, that the original departures in the acetylene gas field rather lent color to the supposed dangers resulting in the attempt to utilize acetylene for domestic illumination and cooking. The day of this preliminary investigation and experimenting in the acetylene world is now past; and when we stop to consider that in the United States alone there are more than 200,000 buildings and 450 entire towns lighted by this means, it would seem that the old prejudice must be fast dying out.

Acetylene has actually fifteen times greater force of lighting power than the common municipal illuminating gas, and it is therefore a mistake to judge the amount of light received from the acetylene flame by the size of the flame itself in comparison with that supplied by any other gas. In Fig. 10 is shown at half actual size the average flame produced by ordinary city gas burning at the rate of 5 cubic feet per hour and giving a light equal to 18 candle power. In Fig. 11 is shown an acetylene flame giving 33 per cent more light; in other words, 24 candle power, and consuming only ½ cubic foot of acetylene gas per hour.

There is absolutely no soot or smoke accompanying acetylene and it never flickers nor varies in intensity. A leak in an acetylene pipe (which, by the way, is no more likely to occur than in any other gas pipe) gives due notice by its odor, but it does *not* asphyxiate — an attribute making it in this respect much safer than ordinary illumi-

nating gas. Besides this it consumes but little oxygen in the air and does not vitiate the atmosphere nor produce an abnormal amount of heat; in fact, the heat produced by the ordinary acetylene flame is less than by any other method of illuminating excepting only that of electricity.

Still another valuable property resulting from its high illuminating characteristics is the advantage that, should a burner be accidentally left open or blown out, the amount of acetylene escaping would be so small as not to cause either explosion or asphyxiation even in a small room. An experiment made upon animals showed, that a dog could inhale a mixture containing 20 per cent of acetylene and 80 per cent air for a period of 35 minutes without apparent discomfort, while an attempt to have the animal breathe a mixture of similar strength made with ordinary illuminating gas resulted in death after 10 minutes.

Piping for acetylene is almost identical with the ordinary lines as used for city gas. In fact, a building piped for city gas can have its supply main run to the acetylene generator and give satisfactory service without any alteration whatever, provided that the original gas piping was properly installed. An enlarged view of a typical acetylene gas generator located in the basement and the connections therefor is given in Fig. 13. The burners can be arranged to supply lights of various sizes and candle power, illustrations from actual photographs being shown in Fig. 12. The size of burner in most common use is the ½-foot burner, which gives a 24-candle power light, although for reading purposes a ¾-foot burner giving 36 candle power is preferable for the average person's comfort.

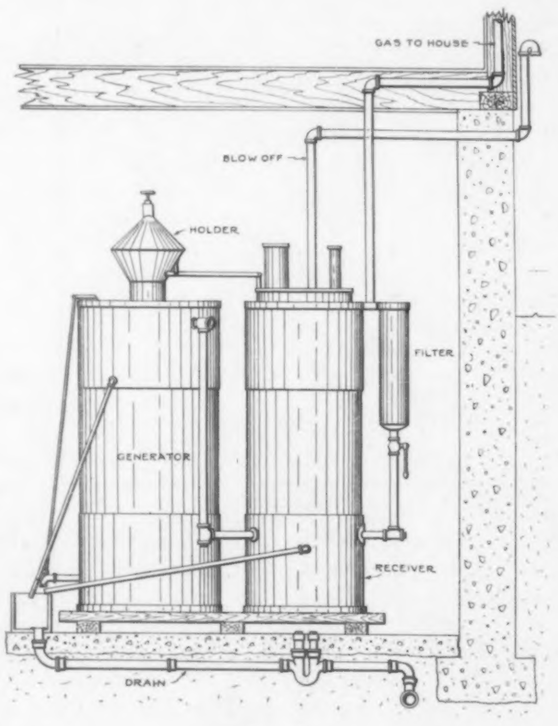


Fig. 13

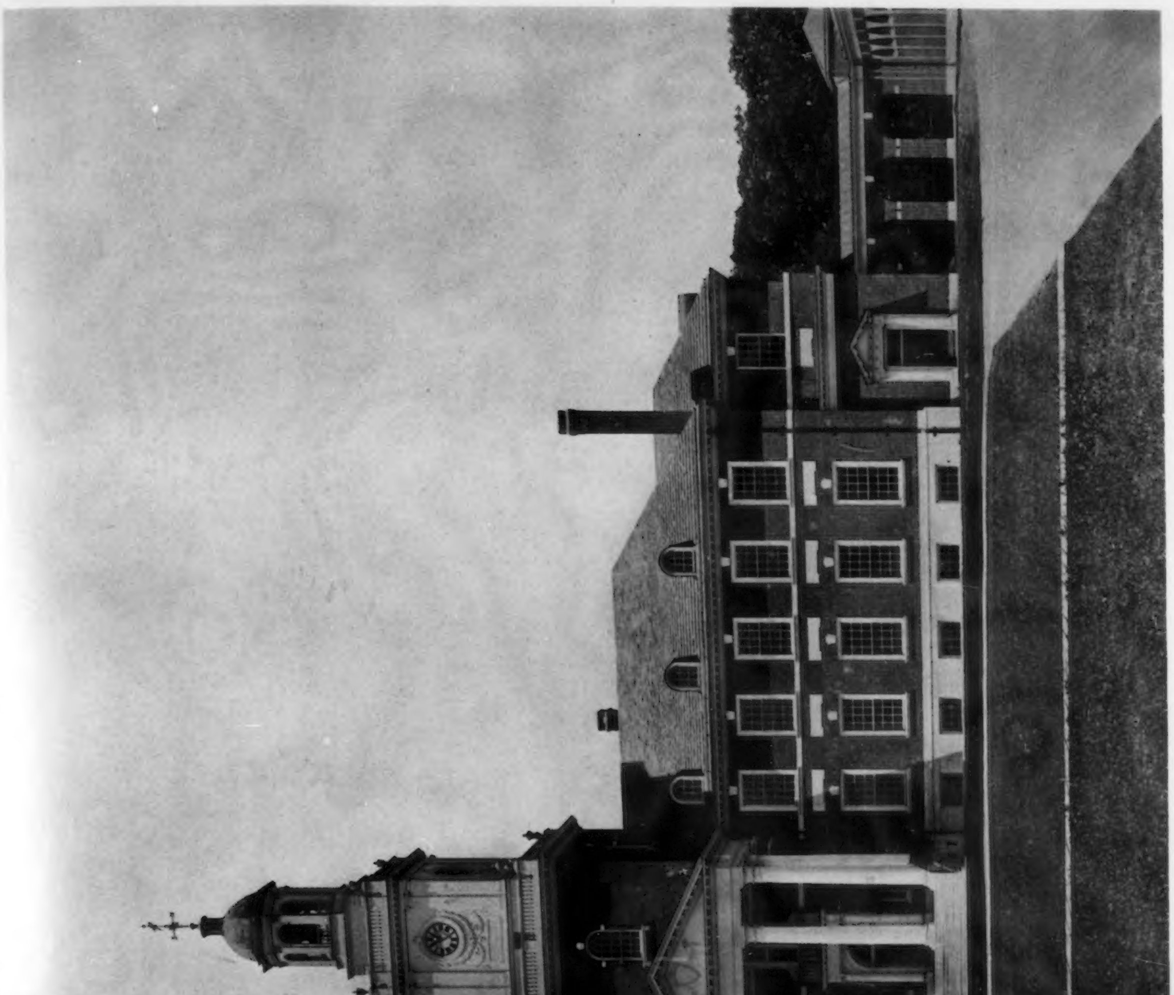
All that is necessary to produce acetylene gas in a finished state ready to light at the burner is to bring calcium carbide—commonly termed "carbide"—into contact with water. The gas, as soon as this is done, is released, leaving only pure lime "whitewash" as a residue. This is not by any means an elaborate process, the difficulty being to control the feeding of the carbide and water so as to produce automatically the quantity of gas required.

Most of the acetylene generators consist of two main parts,—the generator proper in which the gas is produced, and a gas holder which serves to carry a very slight reserve supply, this supply being so small an amount as to hardly merit the name of being a storage of gas. The carbide is placed in a feeding hopper at the top of the tank and feeds down through the neck into the water contained in the generator tank below. As soon as the piece of carbide is dropped into the water below it starts to decompose, producing acetylene gas which rises and flows out through the pipe connection into the gas holder. The gas holder consists of an inverted cylinder with a capped top sitting in another cylinder partially filled with water. The gas is conducted to the interior of the inner cylinder, expelling the water from the inner cylinder and causing it to rise by its buoyancy in much the same method as used in the large city gas tanks with which most of us are familiar. The inner cylinder, in rising, prevents the further feeding of carbide until the gas produced previously, and which is now contained in the cylinder, has been drawn off for use in some part of the house, thus allowing the inner cylinder to fall and again starting the feeding of the carbide. This is the automatic process which only manufactures gas as it is used and which makes the storage of large quantities unnecessary. In some generators the feeding of the carbide is governed by the rise and fall of the water in the cylinder. As soon as the carbide has generated sufficient gas to raise the cylinder (otherwise to lower the water) a little cap is drawn down over the carbide opening so that no more carbide can be fed until this gas has been exhausted.

There can be no question as to the safety of such a system, or the Fire Underwriters would absolutely prohibit its use.

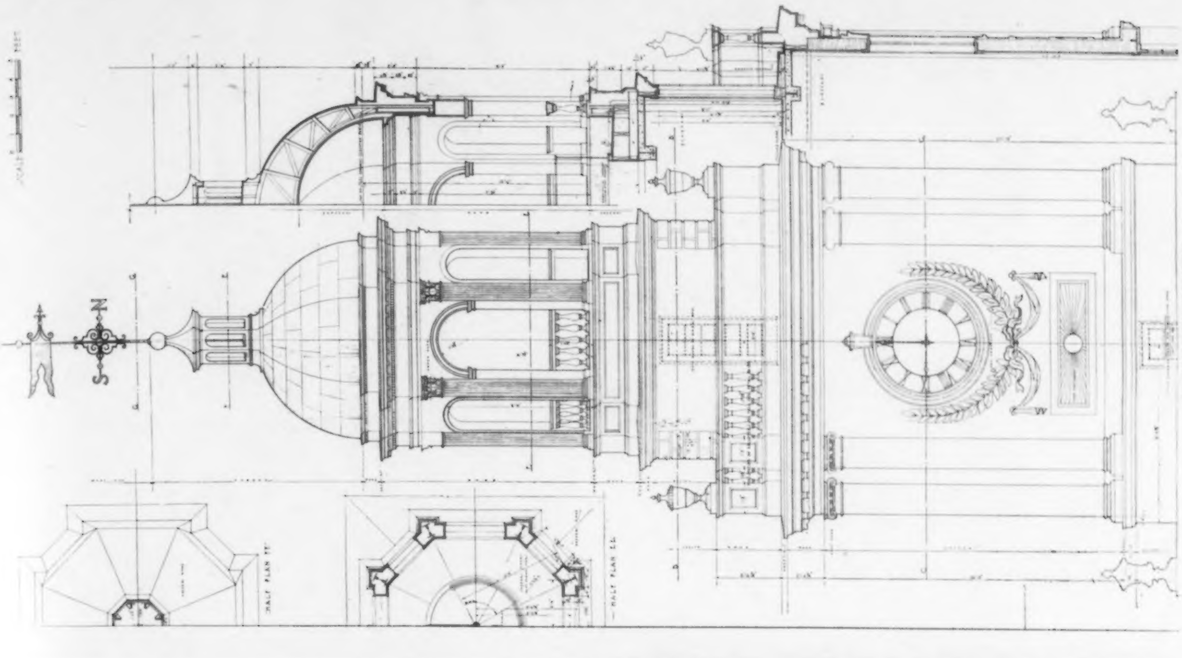
As far as reliability goes, this gas is used by the United States government to supply the lights on the light beacons marking the channels for ships; these beacons must burn continuously and without failure day or night for 60-day periods between trips of the government tugs for re-charging. This is much harder and more exacting service than is required for house use.

There seems to be only one real disadvantage to the use of this system, and this is caused by the non-storage of gas. If by any possibility you reach the end of your carbide, say at 8.30 P.M. in the evening, the insurance regulations will not permit you to re-charge again until the next day. This results in great discomfort and is likely to occur at inopportune times. Some generators, however, have overcome this difficulty by retaining automatically a one night's charge in the carbide holder. When the rest of the carbide charge has been exhausted the gas begins to drop, but the owner is "reprieved" by going down and "putting another quarter in the slot"—that is, he turns on the reserve charge of carbide which will supply gas the rest of the evening and he then recharges the whole apparatus next day at his leisure.



GILMAN HALL, JOHNS HOPKINS UNIVERSITY, HOMEWOOD, BALTIMORE, MD.

PARKER, THOMAS & RICE, ARCHITECTS



DETAIL OF TOWER

DETAIL OF FACADE AND TOWER

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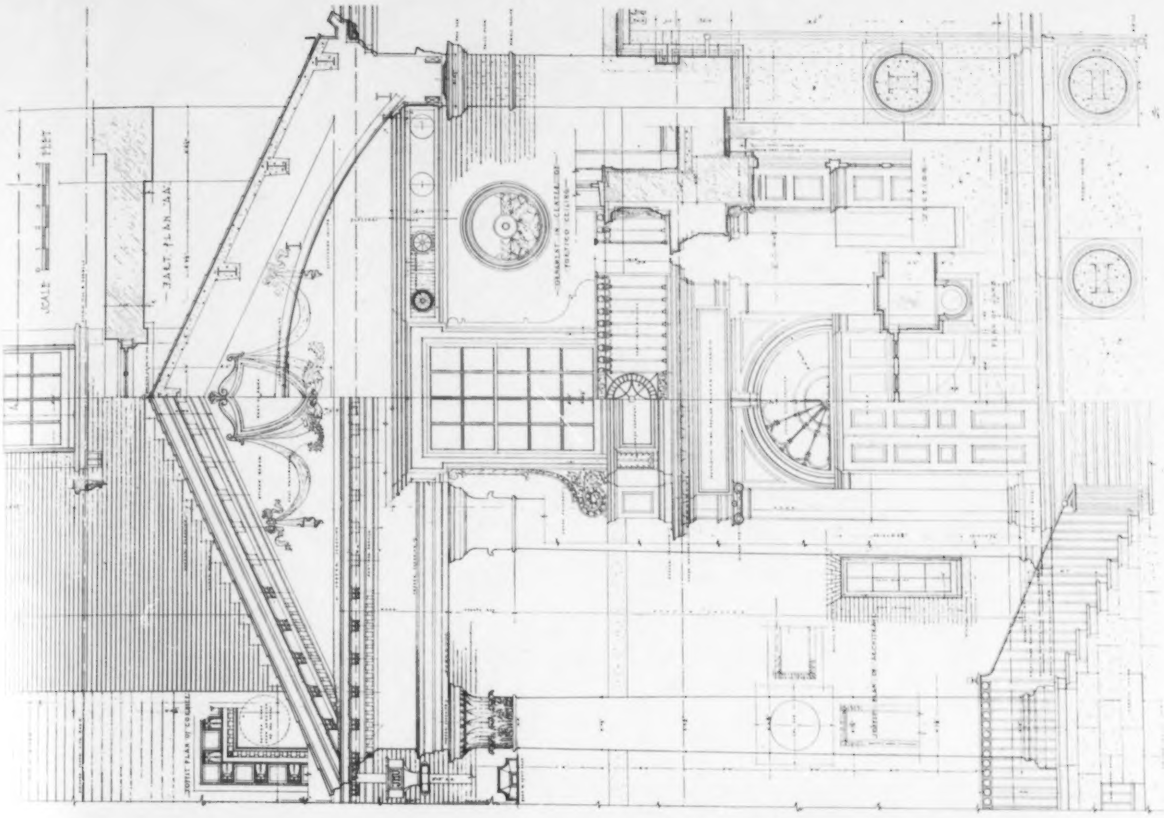
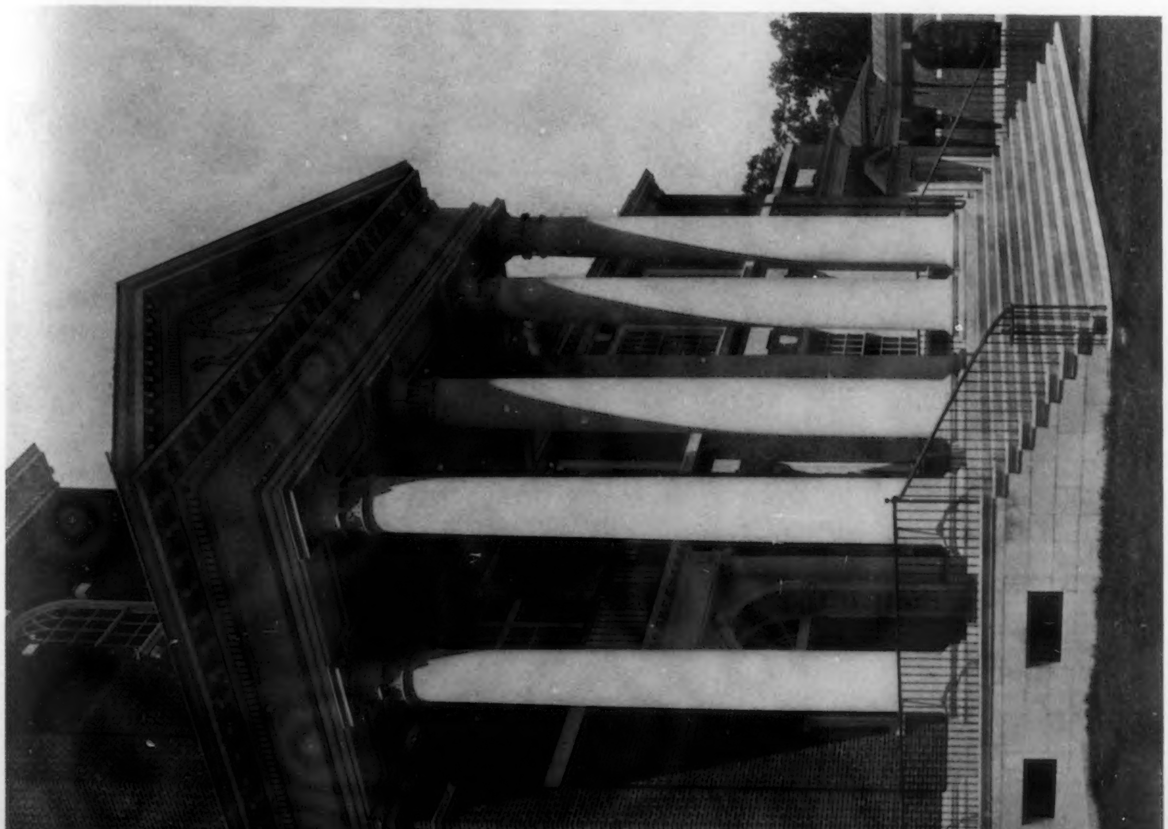
PARKER, THOMAS & RICE, ARCHITECTS



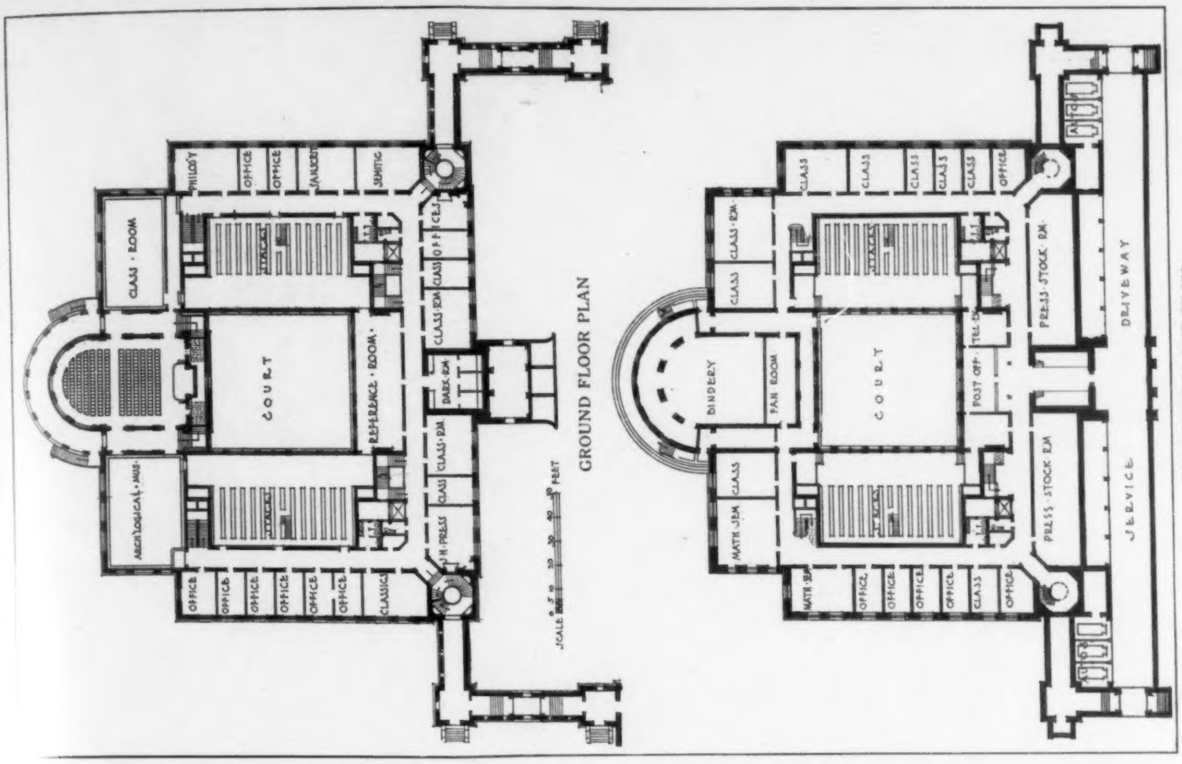
DETAIL OF PORTICO AND DOORWAY



ENTRANCE PORTICO

GILMAN HALL, JOHNS HOPKINS UNIVERSITY, HOMEWOOD, BALTIMORE, MD.

PARKER, THOMAS & RICE, ARCHITECTS



GROUND FLOOR PLAN

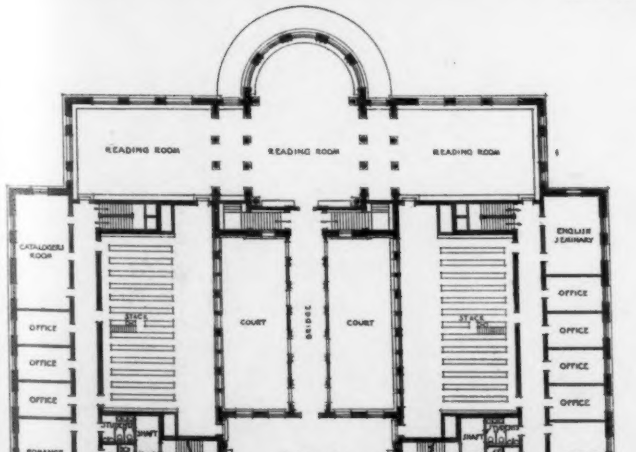
BASEMENT FLOOR PLAN

DETAIL OF RIGHT WING AND ARCADE

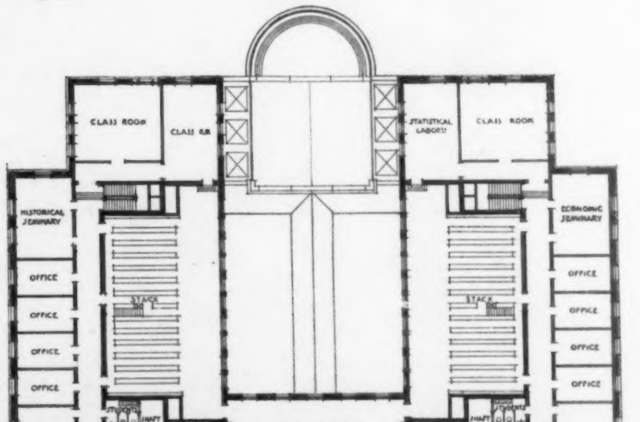
GILMAN HALL, JOHNS HOPKINS UNIVERSITY, HOMEWOOD, BALTIMORE, MD.

PARKER, THOMAS & RICE, ARCHITECTS

VIEW FROM REAR



FIRST FLOOR PLAN



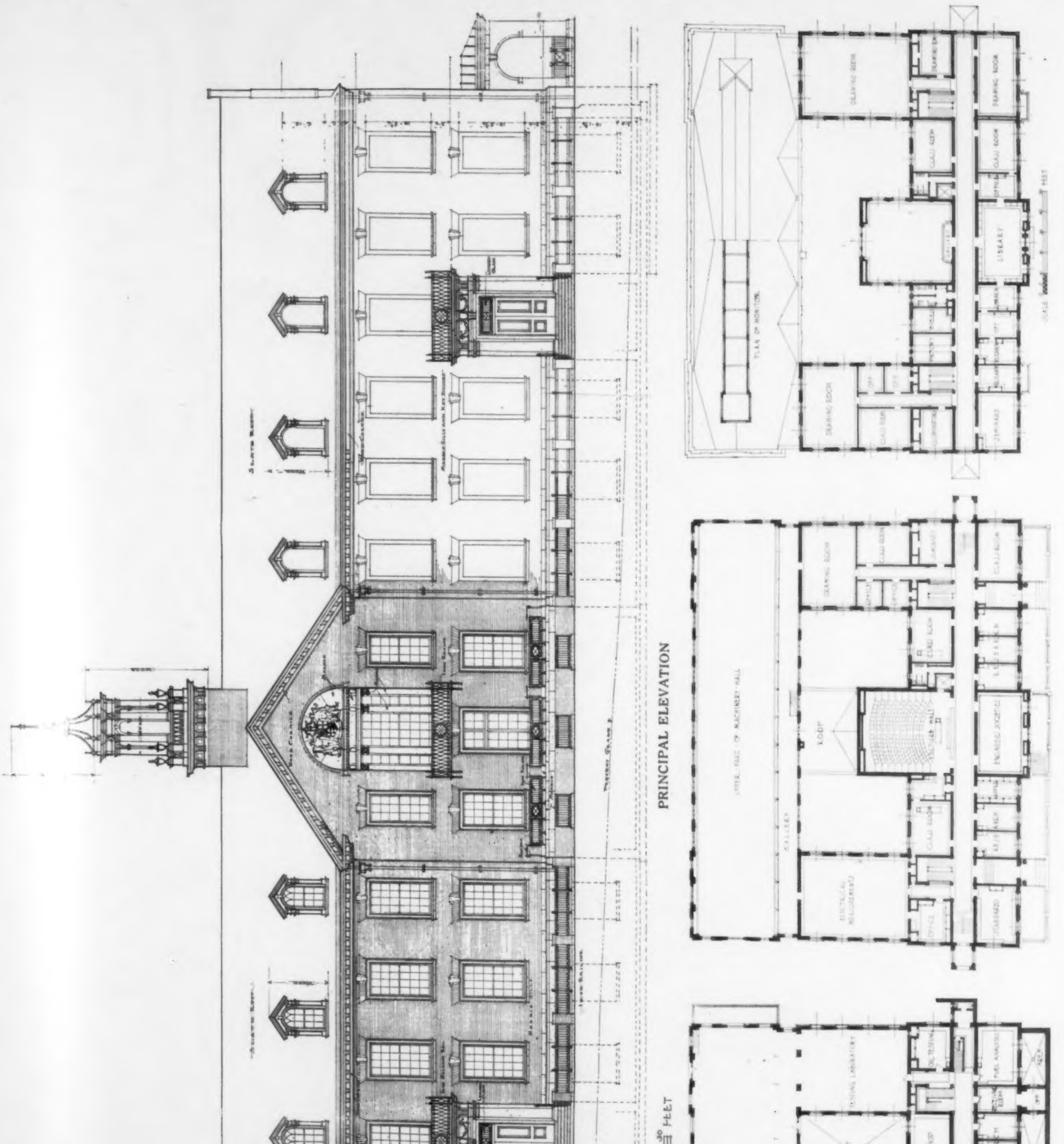
SECOND FLOOR PLAN

GILMAN HALL, JOHNS HOPKINS UNIVERSITY, HOMEWOOD, BALTIMORE, MD.

PARKER, THOMAS & RICE, ARCHITECTS

MECHANICAL AND ELECTRICAL ENGINEERING BUILDING, JOHNS HOPKINS UNIVERSITY, HOMEWOOD, BALTIMORE, MD.

JOSEPH EVANS SPERRY, ARCHITECT



PRINCIPAL ELEVATION

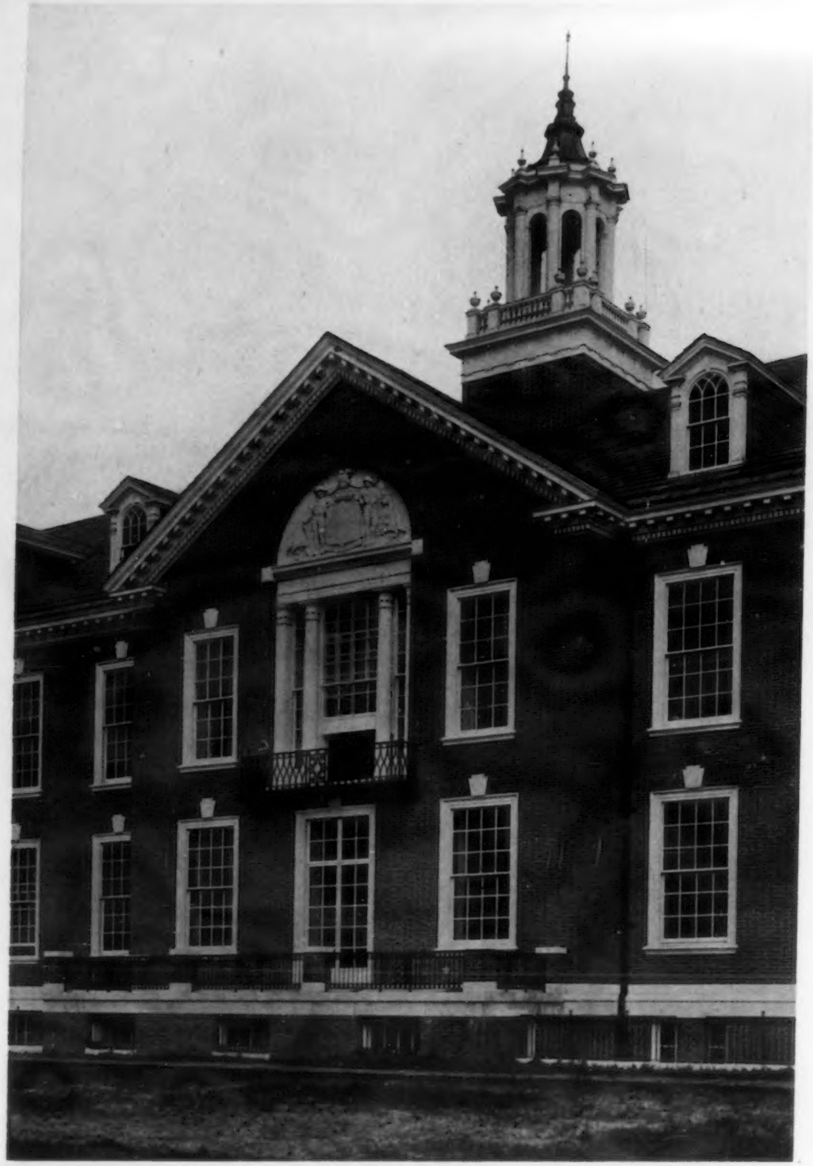
BASEMENT FLOOR PLAN

FIRST FLOOR PLAN

SECOND FLOOR PLAN

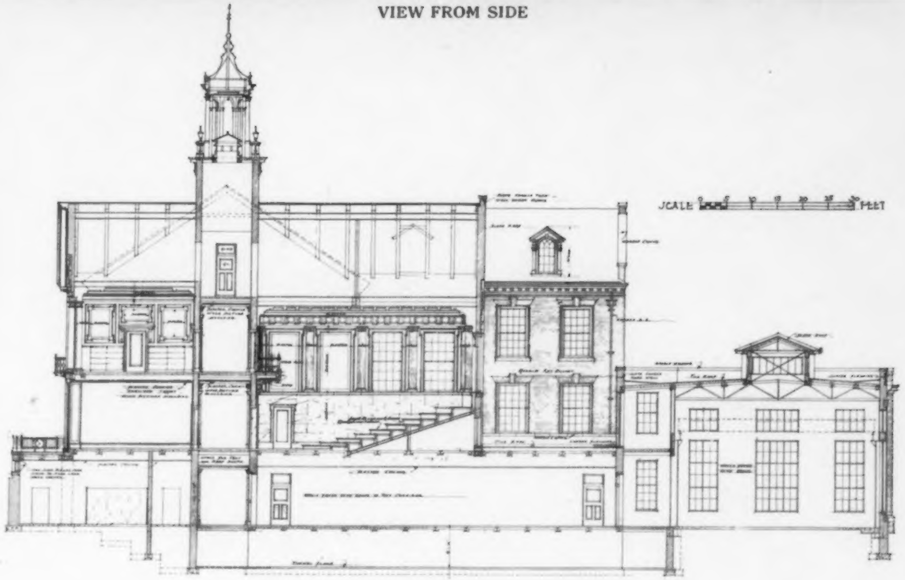
MECHANICAL AND ELECTRICAL ENGINEERING BUILDING, JOHNS HOPKINS UNIVERSITY, HOMEWOOD, BALTIMORE, MD.

JOSEPH EVANS SPERRY, ARCHITECT



DETAIL OF FACADE AND LANTERN

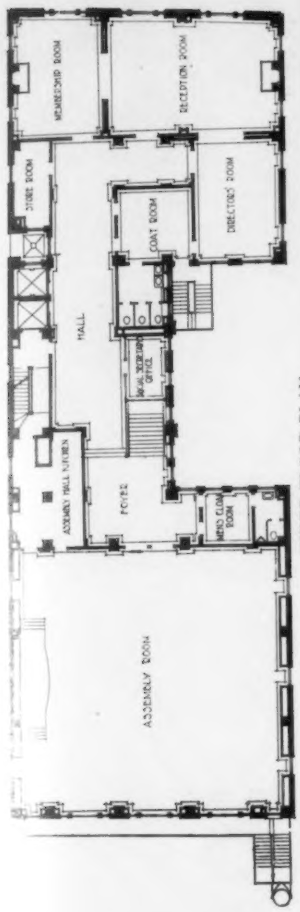
VIEW FROM SIDE



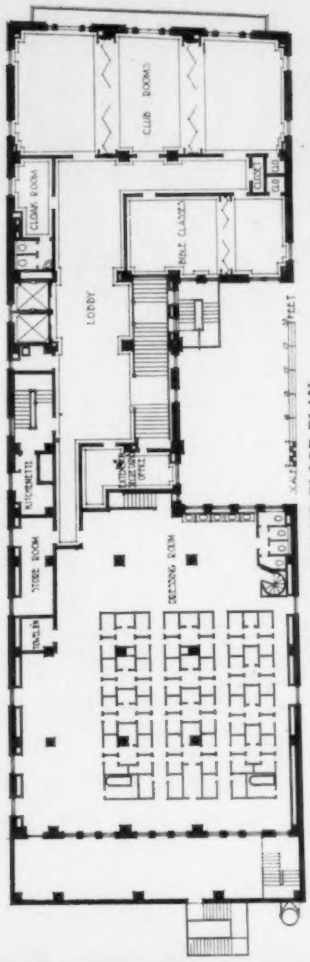
TRANSVERSE SECTION

MECHANICAL AND ELECTRICAL ENGINEERING BUILDING, JOHNS HOPKINS UNIVERSITY, HOMEWOOD, BALTIMORE, MD.

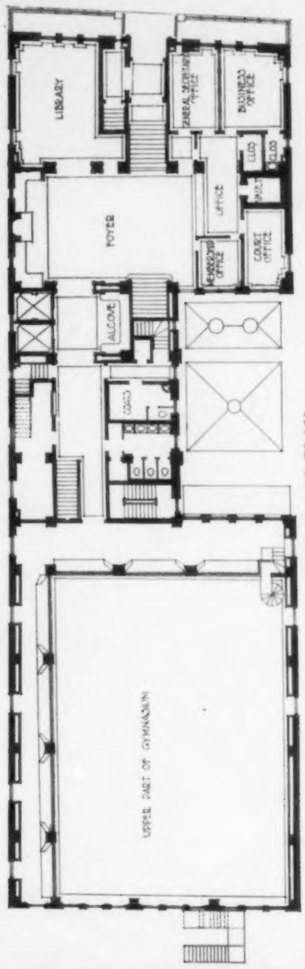
JOSEPH EVANS SPERRY, ARCHITECT



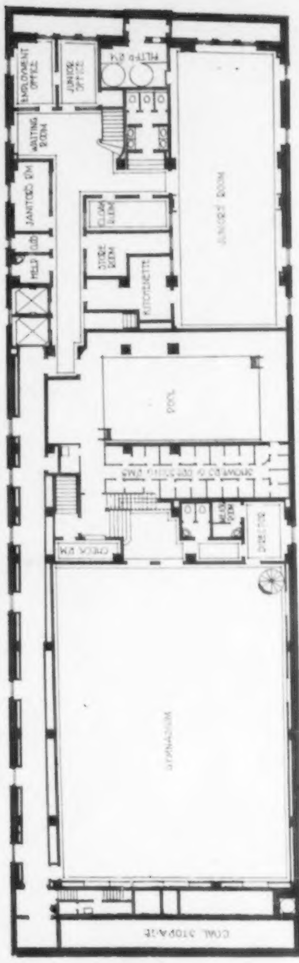
THIRD FLOOR PLAN



SECOND FLOOR PLAN



FIRST FLOOR PLAN

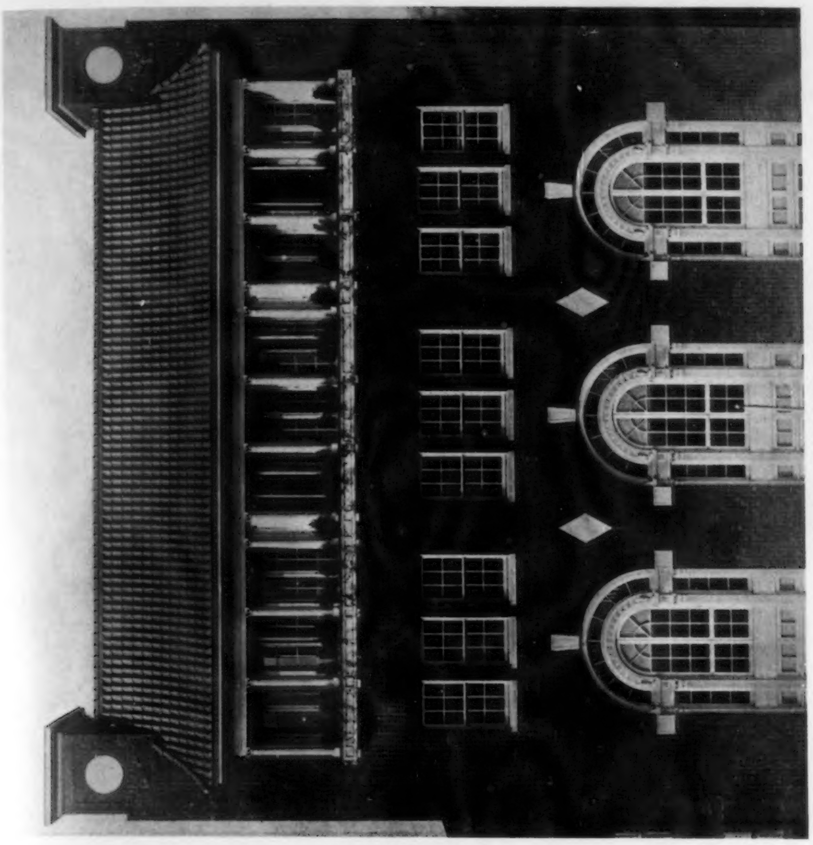


GROUND FLOOR PLAN

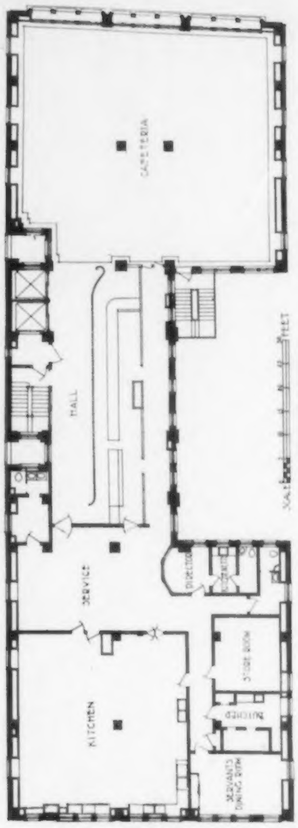
PRINCIPAL FACADE

Y. W. C. A. BUILDING, NEWARK, N. J.

GEORGE B. POST & SONS, ARCHITECTS



DETAIL OF UPPER STORIES



FIFTH FLOOR PLAN

DETAIL OF ENTRANCE

Y. W. C. A. BUILDING, NEWARK, N. J.

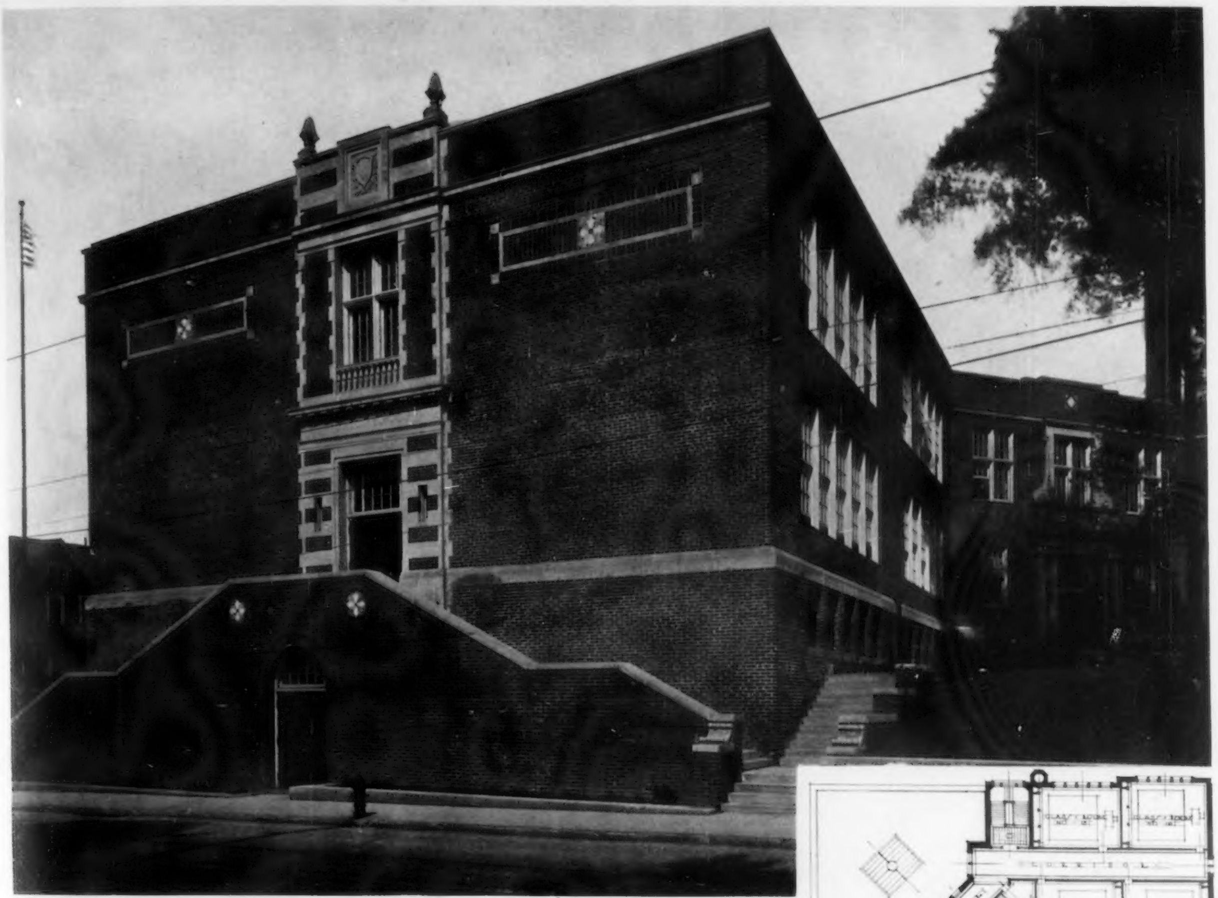
GEORGE B. POST & SONS, ARCHITECTS

GENERAL VIEW

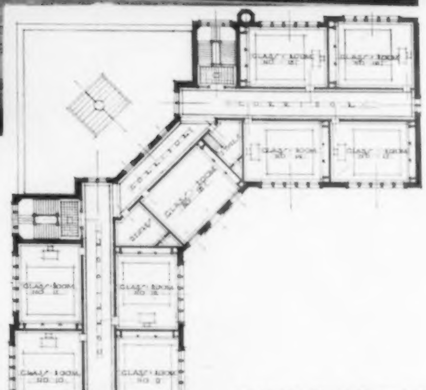
DETAIL OF PRINCIPAL ENTRANCE

ADDISON SCHOOL, CLEVELAND, OHIO

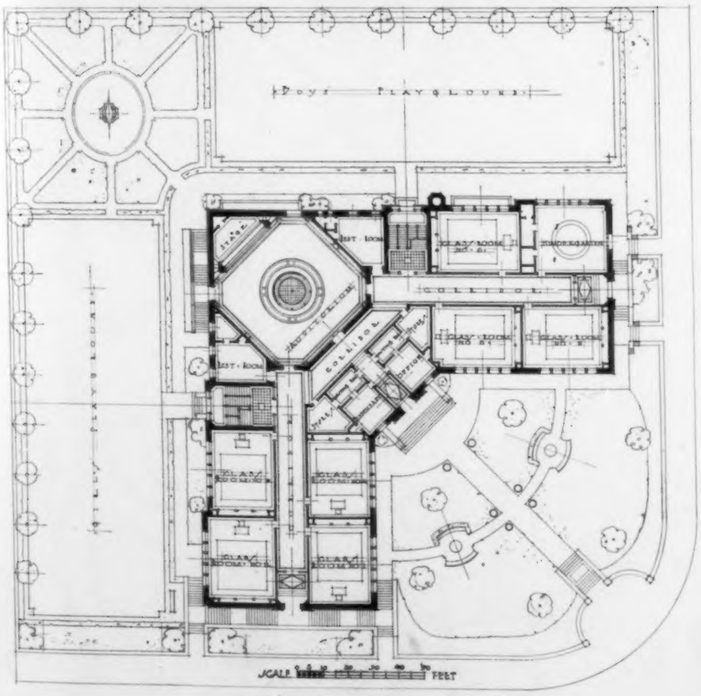
F. S. BARNUM AND W. R. McCORNACK, ARCHITECTS



VIEW OF SIDE



SECOND FLOOR PLAN



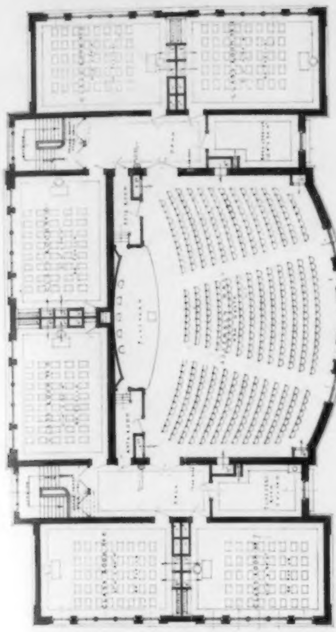
FIRST FLOOR AND PLOT PLAN

BASEMENT FLOOR PLAN

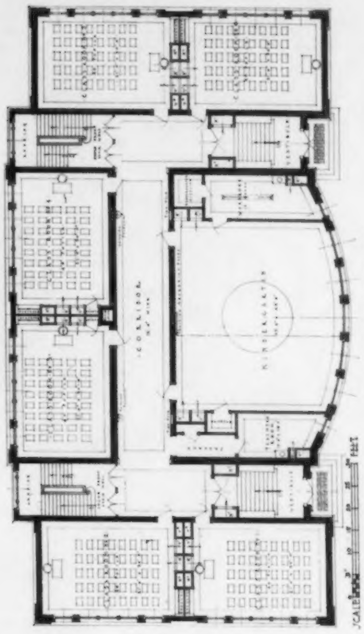
ADDISON SCHOOL, CLEVELAND, OHIO

F. S. BARNUM AND W. R. McCORNACK, ARCHITECTS

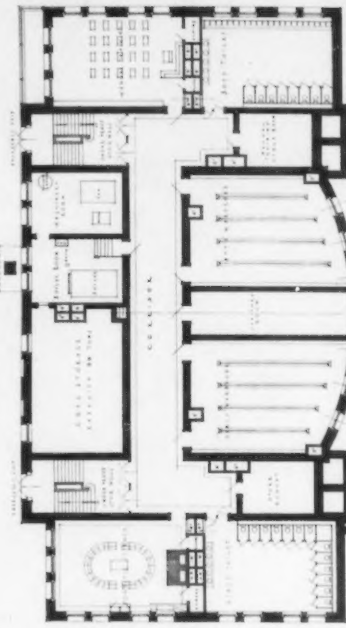
WALKER SCHOOL, CONCORD, N. H.
HUSE TEMPLETON BLANCHARD, ARCHITECT



SECOND FLOOR PLAN



FIRST FLOOR PLAN



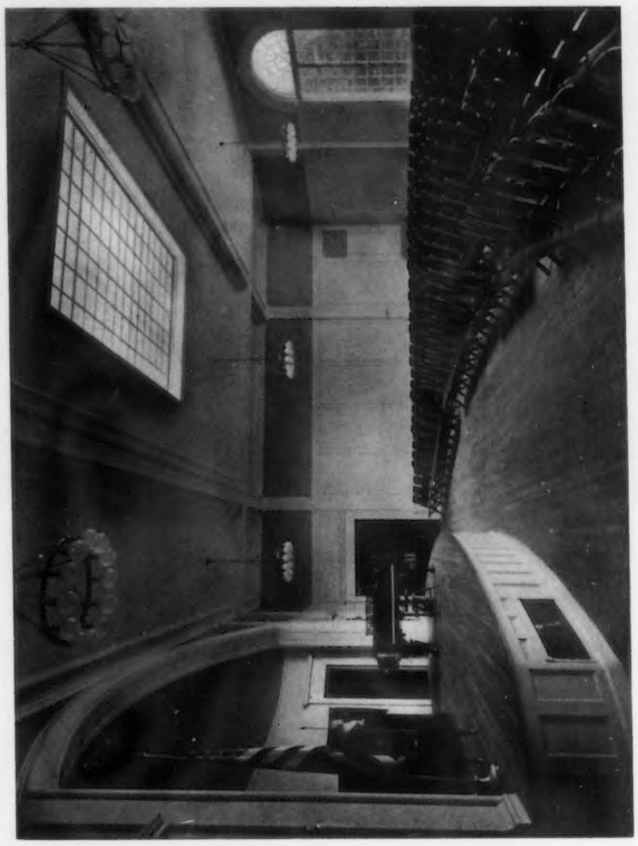
BASEMENT FLOOR PLAN

DETAIL OF PRINCIPAL FACADE

WALKER SCHOOL, CONCORD, N. H.

HUSE TEMPLETON BLANCHARD, ARCHITECT

VIEW OF SIDE



ASSEMBLY HALL

DETAIL OF ENTRANCE

WALKER SCHOOL, CONCORD, N. H.
HUSE TEMPLETON BLANCHARD, ARCHITECT

New Building for the T-Square Club, Philadelphia, Pa.

WILSON EYRE & McILVAINE, *Architects.*

By JOHN F. HARBESON.

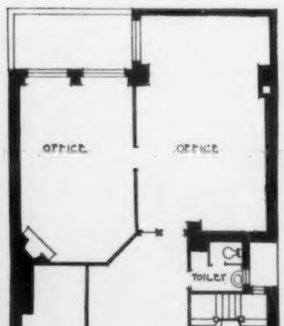
THE degree of satisfaction with which the T-Square Club entered its new building on Quince street, Philadelphia, may be gathered from the fact that a whole week of celebration was necessary to express it, comprising a dinner, a christening, a lecture, an exhibition, and a dance. For years this club — one of the oldest of the architectural clubs of our cities — has looked forward to having its own building; each year committees were appointed, and reported, but it remained for one who has left the profession and is now a contractor to work out the financing of the scheme, without increasing the annual dues. He has been so successful, indeed, that when the bond issue is paid off and the mortgage liquidated, no yearly dues will be required, as the renting of the lower floors gives revenue enough for the ordinary club expenses.

The new building is a three-story brick structure with a fire tower — I mention the fire tower as, for a long time, the "committee of the whole" that was in the habit of visiting the site during the progress of the work thought that there would be room for nothing else, thanks to the requirements of the Bureau of Building Inspection. The club house was designed by Wilson Eyre, who with John Stewardson, Walter Cope, Arthur Truscott, Walter Smedley, and other lovers of pencil sketching, founded the club in 1887. Needless to say, he was constantly given the "help" of advice from the rest of the profession, who felt themselves in the strange and very comfortable position of "client." The structure as completed was an excellent example of the master-bricklayer's art, and as such could hardly have been surpassed; but this result having been achieved, and the novelty wearing off, it was decided to paint the front a battleship gray. This was fortunately spared from the tilework around the door, where the club seal has been translated into burnt clay.

From its earliest history the club has been somewhat of a school, and though the early sketch problems and "redesigning" competitions have given way to the modern atelier in design, the aim has always been "opportunity for the diligent."

View of Facade

Detail of Entrance



First Floor Plan

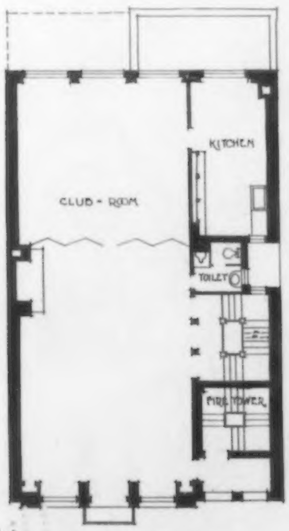
Detail of Stairway

The new, well lighted drafting room on the top floor of the building, with its sixty tables, is constantly in use in the winter months; its popularity is due to two facts, the criticism of Paul Cret and Leon Arnal (until the present war started), and that the last four winners of the Paris prize have been members of the T-Square Club, to say nothing of the fact that there is no fee for this criticism, which is given free to all members who avail themselves of this privilege.

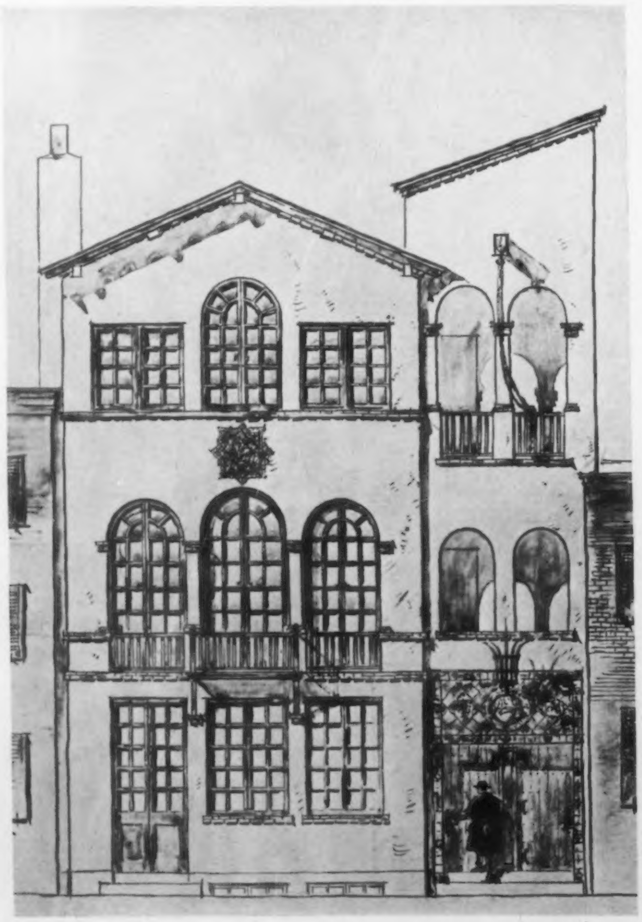

Interior of Club Room

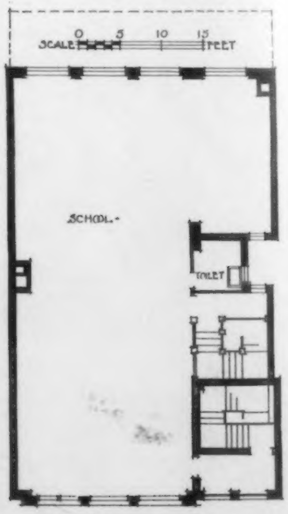
On the second floor is the "club room," by night a meeting place or lecture hall, as the case may be, and by day a dining room, or "grub club," as it is familiarly called. The long oak tables show the friendly democratic spirit that rules here between him who has "arrived" and him who hopes to do so in the near future. The masters of the profession drop in here for lunch now and again, among them a past president of the American Institute of Architects. It is in this room, around these old tables full of memories, that the younger generation airs its radical views, and the older men with wiser heads nod indulgently. But the prevailing note is youth and enthusiasm, especially enthusiasm. Even the older men are enthusiastic, and ever since that memorable day when a former president, in his valedictory address, urged the members to "tread upon the coat-tails of posterity," they have been stirred to make of this City of Brotherly Love a place of civic beauty, equal to the traditions of our early architecture of the State House, Christ Church, and the old Stock Exchange.

The new club house ends satisfactorily many years of striving for permanent quarters. When the Club was first formed, meetings were held in the offices of various members, and it was not until March, 1891, that it realized in some measure its ambition to have quarters of its own. In that month a meeting was held in the attic of an old house on Thirteenth street, fitted up in characteristic fashion, and often talked of by the older reminiscent members. The Club continued to occupy this room until 1893, when the School of Industrial Art offered it more commodious and pretentious quarters, on condition that the T-Square Club assume charge of all responsibility for the courses in Architectural Design and agree to provide for the delivery of five lectures per year, but the arrangement was found impracticable and a stable on Chancellor street was altered, to provide a home where traditions might form.



Second Floor Plan


Architects' Drawing of Facade



Third Floor Plan

Dudley Memorial Gate, Harvard University.

HOWELLS & STOKES, ARCHITECTS.

BAS-RELIEF OF GOV. DUDLEY

IN MEMORY OF
THOMAS DUDLEY
GOVERNOR OF THE
COLONY OF THE MASSACHUSETTS BAY
BAPTIZED OCTOBER 12, 1576
AT YARDLEY HASTINGS, ENGLAND
MARRIED AT HARDINGSTONE, ENGLAND
DOROTHY YORKE APRIL 25, 1603
AND AT ROXBURY MASSACHUSETTS
CATHERINE HASBURNE WIDOW APRIL 14, 1624
DIED AT ROXBURY JULY 31, 1653

IN 1597 HE RECEIVED A CAPTAIN'S COMMISSION
FROM QUEEN ELIZABETH AND WAS AT THE SIEGE OF
AMIENS UNDER HENRY IV OF FRANCE
ONE OF THE TWELVE SIGNERS OF THE
CAMBRIDGE AGREEMENT AUGUST 26, 1629
SAILED FROM SOUTHAMPTON, ENGLAND
IN THE "ARBELLA" MARCH 22, 1630
CHOSEN DEPUTY GOVERNOR OF THE
COLONY OF THE MASSACHUSETTS BAY AT A COURT OF
ASSISTANTS ON BOARD THE "ARBELLA" MARCH 23, 1630
ARRIVED AT SALEM, MASSACHUSETTS JUNE 12, 1630

A FOUNDER AND THE FIRST HOUSEHOLDER OF CAMBRIDGE 1631
DEPUTY GOVERNOR OF THE
COLONY OF THE MASSACHUSETTS BAY
1630-34 1637-40 1646-50 1651-53
GOVERNOR OF THE COLONY OF THE MASSACHUSETTS BAY
1634-35 1640-41 1645-46 1650-51
ASSISTANT OF THE COLONY OF THE MASSACHUSETTS BAY
CHOSEN "ONE OF THE STANDING COUNSELL
FOR THE TEARME OF HIS LIFE" MAY 25, 1636
APPOINTED IN 1637
BY THE GENERAL COURT HELD AT NEWTOWN
ONE OF THE TWELVE MEN "TO TAKE ORDER FOR A
COLLEGE AT NEWETOWNE"
COMMISSIONER OF THE
UNITED COLONIES 1647-48 1649-50
APPOINTED SERGEANT MAJOR GENERAL
OF THE MILITARY FORCES OF THE COLONY MAY 29, 1644

SIGNED THE CHARTER MAY 31, 1650 OF HARVARD COLLEGE

BURIED IN THE OLD CEMETERY AT THE CORNER
EUSTIS AND WASHINGTON STREETS
ROXBURY, MASSACHUSETTS

BEQUEATHED TO HARVARD UNIVERSITY BY CAROLINE PHELPS STOKES
8TH IN DESCENT FROM GOVERNOR DUDLEY

H. & S. '91. ARCHTS. MCMXV.

WORDING OF INSCRIPTION ON TOWER

ONE OF THE SEMI-CIRCULAR SEATS ON YARD SIDE OF GATEWAY

DUDLEY MEMORIAL GATE, HARVARD UNIVERSITY, CAMBRIDGE, MASS.

HOWELLS & STOKES, ARCHITECTS

Acoustics of Auditoriums.

INVESTIGATION OF THE ACOUSTICAL PROPERTIES OF THE ARMORY AT THE UNIVERSITY OF ILLINOIS.

By F. R. WATSON, *Associate Professor of Physics, University of Illinois.*

THE Armory at the University of Illinois presents an unusual case of defective acoustics because of its very large volume and comparatively small absorbing power. It was built to fulfil the usual requirements of an armory in regard to military drills; but, in addition, it has been used on several occasions for convocations and assemblies where the audiences have been very large. The acoustics proved to be impossible for speaking and music. In view of the proposed continued use of the building for such assemblies, the writer carried on an investigation to determine the possibilities of making it satisfactory in its acoustical properties.

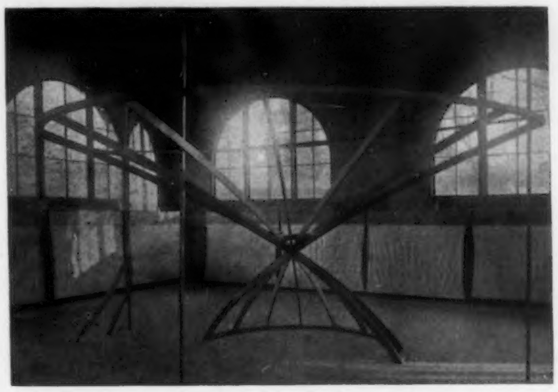


Fig. 1. Framework of Parabolic Reflector

The Armory is 400 feet long, 212 feet wide, and 93 feet to the highest point of the roof. Acoustically, it is defective because of echoes and reverberation. Echoes are set up by the distant walls, while the reverberation is caused by the undue prolongation of sound.

Several experiments were tried to determine the value of special devices for reinforcing and directing the sound. In one case, a huge parabolic reflector of special construction was used. This was based upon the known action of parabolic reflectors in directing sound along the axis of the parabola.*

A modified paraboloid was constructed, the parabolic ribs of which were arranged so as to spread the reflected sound over the entire area occupied by the audience. The framework, pictured in Fig. 1, was covered with oilcloth and mounted over the head of the speaker so that his mouth was at the common focus of all the parabolic ribs. Preliminary tests with the reflector showed that it admirably fulfilled its purpose in directing sound; but when used at an assembly with an audience, its action was practically drowned out by the excessive reverberation which prohibited any possibility of satisfactory acoustics.

Another experiment of like nature involved the use of a special megaphone to distribute the sound of the speaker's voice. This megaphone was more efficient than the reflector, since it utilized all the sound sent out by the speaker instead of only the portion intercepted by the reflector. This device was also of little benefit because of the excessive reverberation.

* "The Use of Sounding Boards in an Auditorium." *Physical Review*, Vol. 1 (2), p. 241, 1913, and THE BRICKBUILDER, June, 1913, and August, 1913.

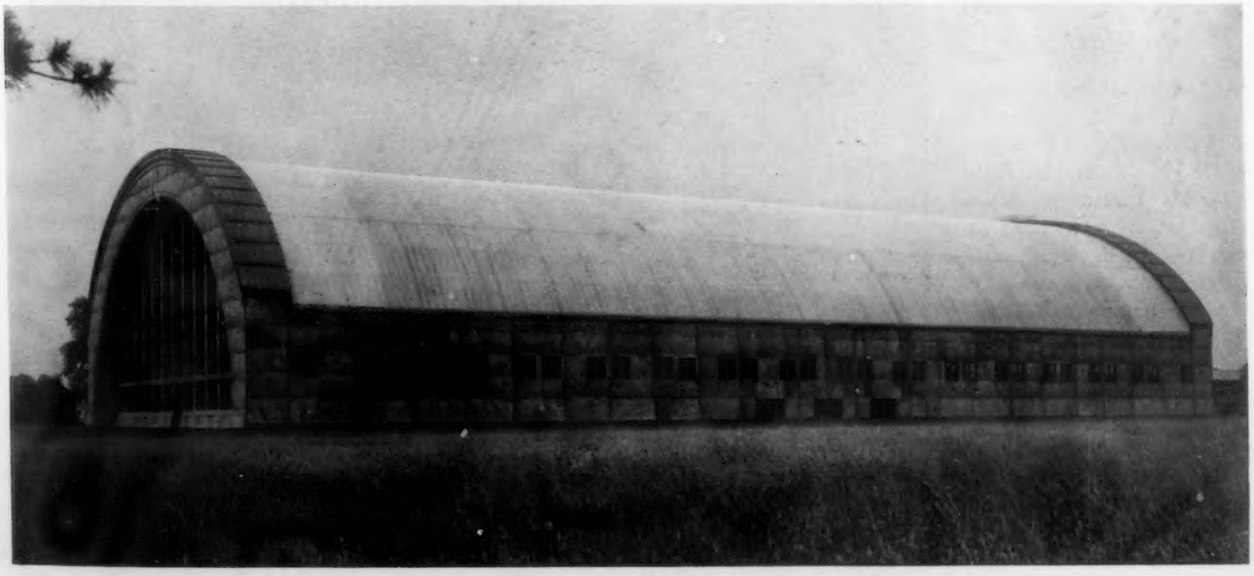


Fig. 2. The Armory at the University of Illinois

Fig. 3. Interior of Armory

A third trial was made by using a number of loud-speaking telephones at different positions in the Armory. This attempt was also unsuccessful, although the telephones when used out in the open air were very effective in reinforcing and directing the sound.

These experiments showed the impossibility of using the entire Armory for speaking purposes unless the reverberation could be materially reduced. The investigation was then directed to the determination of the constants of reverberation and the possibility of correcting them. Sabine's method* was used for this purpose. His formula for reverberation is expressed as follows:

$$t = kv \div a,$$

where t is the time of reverberation, v the volume of the room, a the sound-absorbing power of all the exposed surfaces in the room, and k a constant which is determined experimentally. Applying this formula to the case of the Armory, the volume of which is 6,652,000 cubic feet, and the total absorbing power, without an audience, 13,400 units, the time of reverberation was calculated to be 24 seconds. This value is unusually large. The Auditorium at the University of Illinois, seating 2,200 people, had a reverberation before its acoustical correction of 9 seconds and was considered to be very bad.† The conditions in the Armory by comparison with this case may be inferred to be exceptionally unsatisfactory.

Calculations made to ascertain the effect of introducing sound-absorbing material showed that the installation of 50,000 square feet of hairfelt would reduce the reverberation to 4.66 seconds, a value which would still be too large for satisfactory speaking. The only alternative was to reduce the volume. Calculations were then made for the acoustical properties of a room partitioned off by canvas curtains at one end of the Armory so as to enclose a space 212 feet by 134 feet and 35 feet high. To do this it was first necessary to determine experimentally the action of the canvas in transmitting and absorbing sound. The time of reverberation for the room with an audience of 4,500 people present was then estimated to be 1.1 seconds, a value which has been found by repeated experience to be satisfactory.

On the basis of this calculation a room of the specified dimensions was enclosed at one end of the Armory and used for the University Commencement exercises. (See Fig. 4.) Auditors in all parts of this canvas-enclosed room could hear and understand the various speakers, so that the room was considered a success from the standpoint of acoustics.

A further step to be undertaken in the investigation lies in the proposed installation of some sound-absorbing materials upon the walls of the Armory itself. It is hoped that by this means the time of reverberation may be reduced to a reasonable length and make the building entirely satisfactory for military drills and band concerts. Whether or not it will also be suitable for assemblies where there is speaking, remains to be seen.

Fig. 4. Interior Arranged for Commencement Exercises

* *American Architect*, 1900.

† "Acoustics of Auditoriums," Bulletin No. 73 of the University of Illinois, Engineering Experiment Station.

Group of Village Stores at Chatham, Mass.

HENRY BAILEY ALDEN AND WILLIAM H. COX, ASSOCIATED ARCHITECTS.

VIEW FROM CORNER OPPOSITE POST OFFICE

FIRST FLOOR PLAN

SECOND FLOOR PLAN

DETAIL OF POST OFFICE ENTRANCE

DETAIL OF END STORE

GROUP OF VILLAGE STORES AT CHATHAM, MASS.

HENRY BAILEY ALDEN AND WILLIAM H. COX, ASSOCIATED ARCHITECTS

As He Is Known, Being Brief Sketches of Contemporary Members of the Architectural Profession.

ALLEN BARTLIT POND

ALLEN BARTLIT POND was born in Ann Arbor, Mich., in 1858. He was educated in the Ann Arbor schools and received his B.A. from the University of Michigan in 1880. After a period during which he taught Latin in the Ann Arbor High School and took a course in Real Estate and Contract Law, he came to Chicago and entered the office of S. S. Beman, where he remained in company with his brother, Irving K. Pond, for a year, entering then upon the partnership which has existed ever since.

In 1911 he was given an honorary M.A. at Michigan, in recognition of his many and varied services in behalf of the public, which have been continuous and arduous since his graduation. The president of the University, in conferring the degree, said, "He is commonly known as Chicago's most useful citizen." He was a founder and one time secretary of the Municipal Voter's League, a body which took and has held Chicago's City Council out of the mire, was chairman of the Political Action Committee, and vice-president of the Union League Club; was a founder and is now the president of the City Club, which devotes itself to the study of civic problems and the betterment of municipal conditions; has for many years been secretary of the Hull House Association; was an effective member for years of the Commercial Club Committee on Education, introducing the teaching of domestic science in the public schools, and, through the medium of the Merchants' Club, privately installed equipment and supported night classes. He was secretary of the American Institute of Architects Committee on Standard Documents, gathering and correlating the vast mass of data used by that committee.

He has made several trips abroad for the purpose of rest and study, being a delegate to the International Congress of Architects in Vienna, at one time sent by interested people to study and report on schools for subnormal children, studying foreign methods and modes of city planning and municipal government.

No problem of Chicago life from the terminal situation through council activities, housing, city planning, education, and philanthropy has escaped the illumination of his clear and concise thought and direct act. To all this he has added a critical power of high quality, a thorough knowledge, love, and understanding of all worthy forms of art. He is more than an architect. He is an ideal citizen; giving of his time unselfishly, he is never too busy to help better the condition of those about him. — *C. H. H.*

CHRISTOPHER GRANT LA FARGE

RECENT architectural education has tended greatly to the development of ability to solve problems of design as matters of composition in plan, section, and elevation, sometimes to the neglect of the more subtle and personal qualities of the art. The highest satisfaction that can come from the practice of architecture is, I believe, reserved for those to whom the handling of the actual materials of the building possesses an interest beyond that of the formulation of the design. Grant La Farge unmistakably embodies this point of view and, in the selection and combination of elements that enter into his work, shows much of that exquisite sensitiveness in the matter of texture, combined with color, that gave distinction to the work of his father, John La Farge.

He was born in Newport, R. I., Jan. 5, 1862. His preliminary training was received at the Massachusetts Institute of Technology and in the office of H. H. Richardson.

His work in partnership with George L. Heins, 1886–1907, includes the Cathedral of St. John the Divine and many other interesting ecclesiastical buildings, — graceful, refined, and picturesque in character — although many of them were designed during the period when the heavy type of Romanesque architecture, brought into vogue by the work of Richardson, still dominated the ecclesiastical thought of the country. The firm of Heins & La Farge may justly be regarded as among the pioneers in the most recent revival of the Gothic spirit freed from the limitations of the Gothic style. The buildings for the New York Zoölogical Society at Bronx Park were designed during the later years of this partnership.

His work in partnership with B. W. Morris, 1910–1915, includes the Morgan Memorial at Hartford, a work which might well bring distinction to any architect.

No sketch of his career would be complete without some reference to his other services to the profession and the public. A speaker and writer of unusual precision, simplicity, and vigor, he has brought these abilities to bear as President of the Architectural League of New York and the New York Chapter of the American Institute of Architects, as Trustee and Secretary of the American Academy in Rome, and as a member of various commissions and committees for the improvement of his city and his profession.

His high ideals, imaginative vision, and deep sense of responsibility in all he undertakes render him one of the most useful members of the profession to-day. — *J. M. H.*

CLARENCE HOWARD JOHNSTON

CLARENCE HOWARD JOHNSTON is a native Minnesotan. He was born Aug. 26, 1859, and received his early training in St. Paul schools and offices. His collegiate training was acquired at the Massachusetts Institute of Technology with the class of 1880. At the close of his scholastic work he went abroad to study, traveling extensively in France, Italy, and Asia Minor. Returning to New York, he was employed by Herter Brothers, and there was closely associated with the late C. B. Atwood. In 1886, being tendered several important commissions, he returned to Minnesota and entered the field as a practitioner in St. Paul where he has maintained his office since that time.

Of late years Mr. Johnston's practice has been largely dominated by public work. In 1901 he was appointed architect for the Minnesota State Institutions, a position which he has retained continuously since that time. Prominent among his state commissions are the recently completed penitentiary at Stillwater, which is widely known among penologists as a model of its kind, and the development of the new campus of the University of Minnesota on which new buildings are being erected annually. During his incumbency, each institution has progressed from a state of random expansion to that of normal logical growth in accordance with carefully evolved plans providing for future development. His long tenure of office is in itself evidence that there is a state-wide appreciation of his work.

One of the things which most impresses one about Mr. Johnston is the tremendous enthusiasm with which he approaches every problem connected with his practice. This sincerity and devotion to his art, early in his student days, drew to him several of his fellow draftsmen who were striving along similar lines, and resulted in the formation of the Architectural Sketch Club, which held its early meetings in his rooms and later became the nucleus of the Architectural League of New York.

The combination of sound business judgment and artistic temperament has gained for Mr. Johnston a loyal clientele who entrust him with commissions, confident that their problems will be solved in a broad way, always strong, virile, modern, and yet never taking erratic expression. Time has demonstrated that the patient insistence with which he forces certain convictions has often caused his clients to build better than they knew.

Mr. Johnston is a fellow and ex-director of the American Institute of Architects. Always liberal with his time and energy in all matters which concern the betterment of his profession, he has served the Minnesota chapter both as president and as director.

Kind, genial, sympathetic, he is a constant encouragement to the younger members of the profession whose good fortune it has been to be associated with him in his work. — *S. H.*

JOSEPH H. FREEDLANDER

RETURNING to this country after distinguishing himself abroad as a diplômé of the École des Beaux Arts, Joseph H. Freedlander very early established a reputation by winning competitions for some of the most important architectural work in the country. Daumet, whose pupil Freedlander was in Paris, once remarked in discussing those of his *élèves* that he regarded as having futures, that whatever Freedlander would do would always be noted for the sense of color, the good taste, and especially distinguished by simplicity.

In many ways this prognostication is exemplified in the Perry Memorial, which is at present being erected at Put-in-Bay to commemorate the immortal Perry and the battle of Lake Erie. The column and terrace already completed mark the site of the historic battle, and with the addition of the colonnade and museum which are about to be undertaken, the entire scheme will be completed — as notable and as beautiful a structure as we have anywhere in America. I doubt very much whether Europe will be able to offer, when this holocaust is over, many memorials superior to it, though in magnificence and largeness the Vittorie Emmanule stands of course alone. But even comparing it with this great work, the simplicity of the Perry Memorial is to my mind appealing.

Before going to Paris, Freedlander had studied at the Massachusetts Institute of Technology. When he came back from Paris he entered at once into active practice and distinguished himself by almost immediately winning the competition for the National Home for Disabled Volunteer Soldiers at Johnson City, Tenn., one of the most important pieces of work that the United States Government had undertaken in some years.

In other and later competitions, Freedlander's name became familiar and there were very few important structures where competition was invited that it did not appear.

In the building of the new Harlem Hospital for the City of New York he embodied the most modern hospital technique in construction and finish, and in these three early works established the reputation for originality of design and beauty and simplicity of ideas.

The remodeling of Samuel Tilden's house at Graystone was another achievement that attracted considerable attention, as much because of the contribution of the architecture as because of the historic importance of this famous old home.

Mr. Freedlander is a man of broad culture and ideas and has been associated with many public movements in New York City, as well as artistic and architectural movements in France. He is president of the Société des Architectes Diplômés par le Gouvernement, a trustee of the Museum of French Art, an associate of the National Academy of Design, chevalier of the Legion of Honor, and in the Salon of 1913 received a bronze medal, which is the highest award that can be given to a foreigner. — *G. H. P.*

PLATE DESCRIPTION.

GILMAN HALL, PLATES 136–140, and the MECHANICAL AND ELECTRICAL ENGINEERING BUILDING, PLATES 141–143, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MD. These two buildings are among the first to be completed of the large group which, when completed, will make up the new home of the University.

Gilman Hall, named in honor of the first president of the University, is the dominant note of the whole plan, both by reason of its location and of its design. It is given over to the study of the humanities; there are the Memorial Hall, library, seminar rooms, department offices and class rooms, and also the students' post office. The great size of the building is not apparent from the front where only two stories and the attic are to be seen; but in the rear, due to the sudden fall of the land, there are four floors besides the attic, making possible a great many additional, well lighted offices and class rooms in the basement and ground floors.

The Engineering Building marks a departure in the educational policy of the University as it is evidence of the creation, or rather the revival, of an engineering department. It is one of two buildings made possible by appropriations of the Maryland legislature.

The building is on the south quadrangle of the new development and is 204 feet long. On the first floor is the auditorium fitted for experimental demonstration and class-room work. The library, class rooms, and drafting rooms are on the second floor; while the attic provides facilities for research and experimental work. Machinery Hall extends completely across the rear, connecting the two wings of the building, and is to be the principal laboratory for experiments with large machinery.

The general plan for the University makes use of the old Homewood estate and the mansion itself, once the home of Charles Carroll, is to be a part of the scheme, probably as a faculty club house. It is this colonial inheritance that has been recognized by the architects and has set the architectural style of the new buildings throughout. The walls are of a similar red brick and the trimmings of white marble. The cornices are wood as are also the clock tower on Gilman Hall and the cupola on the Engineering Building.

Y. W. C. A., NEWARK, N. J. PLATES 144, 145. All of this building is devoted to institutional purposes, there being no bedrooms or living quarters. In the basement are the gymnasium and swimming pool with showers and dressing rooms, and space for the Junior department. The first floor is occupied by the usual offices; while on the second floor are rooms for the meeting of organizations and dressing rooms for the gymnasium. The third floor is occupied by the assembly room and rooms for entertaining. The fourth floor is devoted entirely to rooms for the various classes in millinery, cooking, dressmaking, etc. The cafeteria and the kitchen are on the fifth floor.

The exterior is of red brick laid in an "all-headers" bond. The basement wall is faced with marble and the entrance is also marble. The treatment of the long windows and the balcony effect at the fifth floor are of wood.

ADDISON SCHOOL, CLEVELAND, OHIO. PLATES 146, 147. The controlling considerations in determining the type of plan for this building were the limited size and the elevation of the lot, and the location of a number of large trees. These conditions and the considerable variations in street grades gave reason for the approaches to the first floor, which permit of a basement entrance at street level, as the normal basement floor is two feet above the sidewalk at this point.

The walls are of brick laid with a wide flush cut joint, in light colored mortar, with trimmings of buff limestone.

The construction is strictly fireproof, except in case of the auditorium roof; but the auditorium is separated by heavy brick walls and metal doors. All stairs are enclosed in brick or fire-resisting walls, the glazed partitions being of hollow metal with wired glass and hollow metal doors. The stairs are of cast-iron and steel, with asphalt treads. The floor construction is of combination hollow tile and reinforced concrete joists, supported upon the exterior brick walls, and interior steel beams and columns, fireproofed. The floors of all corridors are finished with cement; while those of the class rooms, auditorium, and subordinate rooms are maple.

The heating and ventilating is by a combination direct and indirect system. The corridors, toilets, etc., are heated by direct steam radiators; and the class rooms, auditorium, and other parts by a combination of direct radiation and warmed air.

The building and equipment (not including furniture) cost 17½ cents per cubic foot, or $5,840 per class room, an allowance of three class rooms being made for the auditorium.

WALKER SCHOOL, CONCORD, N. H. PLATES 148–150. This building was erected on a historical site in the oldest part of the city, and it was therefore thought fitting to make the exterior as Colonial in style as the requirements of a modern school permit.

The foundations, base course, and exterior trimmings up as far as the cornices, are of local granite. The brick for the exterior is selected common local brick, similar in appearance to "Harvard" brick. The exterior cornices and the frames around the entrance doors are of wood.

The floor construction throughout and all stairs are fireproof, of the type known as the combination hollow tile and concrete. The class rooms have maple floors, and the corridors and stairs a patented red flooring. The interior bearing walls are solidly built of brick, and all partitions are of terra cotta, so that the only portion of the building not entirely fireproof is the roof construction which is of frame covered with pitch and gravel.

The finish in the Assembly Hall is whitewood painted, and elsewhere it is of chestnut stained dark. Each class room has a bookcase and a teacher's closet. The lighting in the class rooms is semi-indirect, the heating throughout by steam, and the ventilating by the gravity system.

The total cost of the building, including grading, architect's fees and disbursements, was $74,121, and the cost per cubic foot, 17 cents.

EDITORIAL COMMENT AND NOTES FOR THE MONTH

EACH time that any one genius has taken a revolutionary step, his followers have generally destroyed its worth. Fired by the feeling of freedom which we all possess, an architectural spirit will often break forth in a vein of originality which is believed to be better than the following of tradition. The layman, too, frequently utters a plaint demanding an American style of architecture. The idea seems to be that a national style should spring forth as though at the touch of some wizard; but no new style can come in this way and continue long enough to be of a real value.

A new style will come rather as a gradual evolution and without conscious effort if a body of experts work together upon right principles. And these principles have come to be generally recognized as: a careful application of the structural principles which has governed all great architecture, with a logical application of new methods of construction; a careful regard for the laws of nature — such as the amount of sunlight, the heat of summer, or the extreme cold of the winter; an observance of the laws of æsthetics which should govern all design as mass, rhythm, balance, and proportion; and freedom from all decoration which does not express or emphasize or refine the requirements of the problem.

It has been by rigid adherence to these principles through many years, generally centuries, that masterpieces of architecture have been evolved in various countries and in various styles, and it cannot but be believed that such will be the case in this age and in this country.

In this striving to attain a truthful expression of our national consciousness it should be remembered that while a knowledge of the past is necessary, as much or even more can be learned from our contemporaries as from our predecessors. It is by keeping the mind open to reason, by viewing the work of any one, no matter how revolutionary he may be, by grasping any truth that may be found in it and joining the strife on the side of that truth; it is thus that a body of competent persons will be formed through whom can be forwarded a real nationalism in our art.

A GREAT deal of criticism has been directed against the ornament in use to-day, so that any new thought on this subject is particularly interesting. Mr. Claude Bragdon has just published a small book entitled, "Projective Ornament," which is introduced with the statement, "In contemplating the surviving relics of any period in which the soul of a people achieved æsthetic utterance through the arts of space, it is clear that . . . in their ornament they had a form language. To-day we have no such language; . . . that we shall develop a new form language, it is impossible to doubt."

The source from which Mr. Bragdon would obtain this new form language is geometry. He has been known for many years as an investigator in the realms of mathematics and his earlier booklet, called "A Primer of Higher Space," is an exceedingly clear treatise on the fourth dimension. It is largely from fourth dimensional figures that Mr. Bragdon wishes to take the elements of a new decorative language, or rather from the projections of such figures in two dimensions.

Several of the elements seem quite mechanical and uninteresting, leaving their mathematical origin too obvious; but in the application which Mr. Bragdon has made of others, we find very striking beauty. The book is filled with charming black and white designs, which because of their variety and originality demand attention. The author advises that the student who would use projective ornament should not seek to achieve results too easily or too quickly, but first to "draw them as geometrical diagrams . . . then fill in certain spaces for the purpose of achieving contrast . . . This done, the application of color is the next step."

Here is truly a new source for ornamental design, and those who would see a new spirit in architecture and architectural ornament would do well to listen to this theory. One of the greatest points in its favor is that it is not revolutionary, not a scheme evolved from the sudden idiosyncracy of one man, but is his application of that "world order which number and geometry represent."

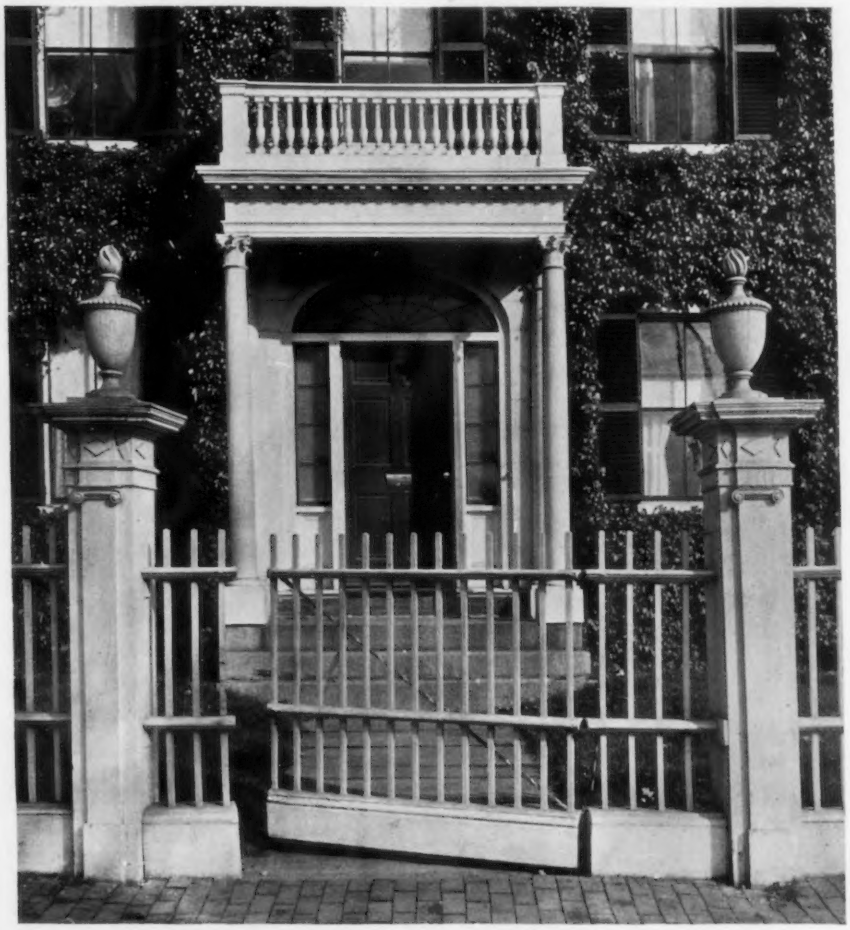
THE Master Builders Association of Boston has recently issued an announcement to its members concerning the new "Standard Documents" published by the American Institute of Architects. After briefly surveying the origin of these revised forms and pointing to the authoritative part played by builders in their revision, the Board of Directors add a hearty commendation of the Documents thus: "This explanation is made chiefly . . . that contractors, architects, and owners generally may know that these Documents have been drawn with the greatest care and that no contractor, architect, or owner need hesitate to make agreements based on them." Such co-operation as this between builders and architects must work for the mutual benefit of both.

It is to be hoped that other building organizations throughout the country will officially endorse the "Documents," and it should be the purpose of architects to call the matter to their attention.

THE Jury of Awards for The Friends of Young Artists has announced the thirteen successful competitors in the recent competition for the design of a private mausoleum. The first prize of $200 was awarded to B. Hoyt of New York, the second prize of $150 to John F. Harbeson of Philadelphia, and the third prize to F. L. Finlayson of New York. Ten prizes of $25 each were also awarded.

265

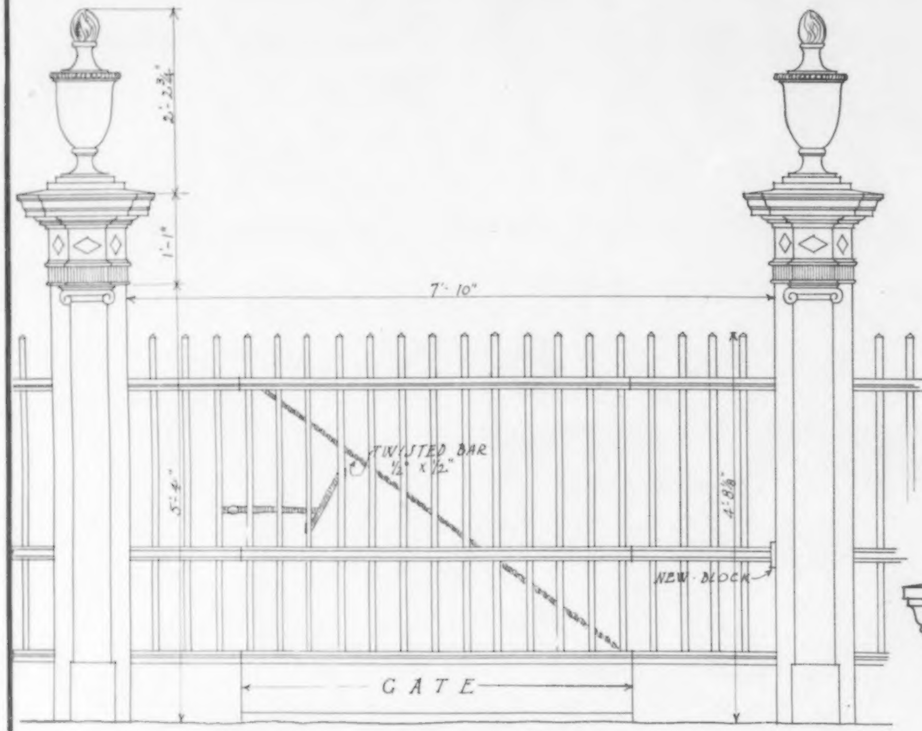
THE BRICKBVILDER COLLECTION
EARLY AMERICAN ARCHITECTURAL DETAILS



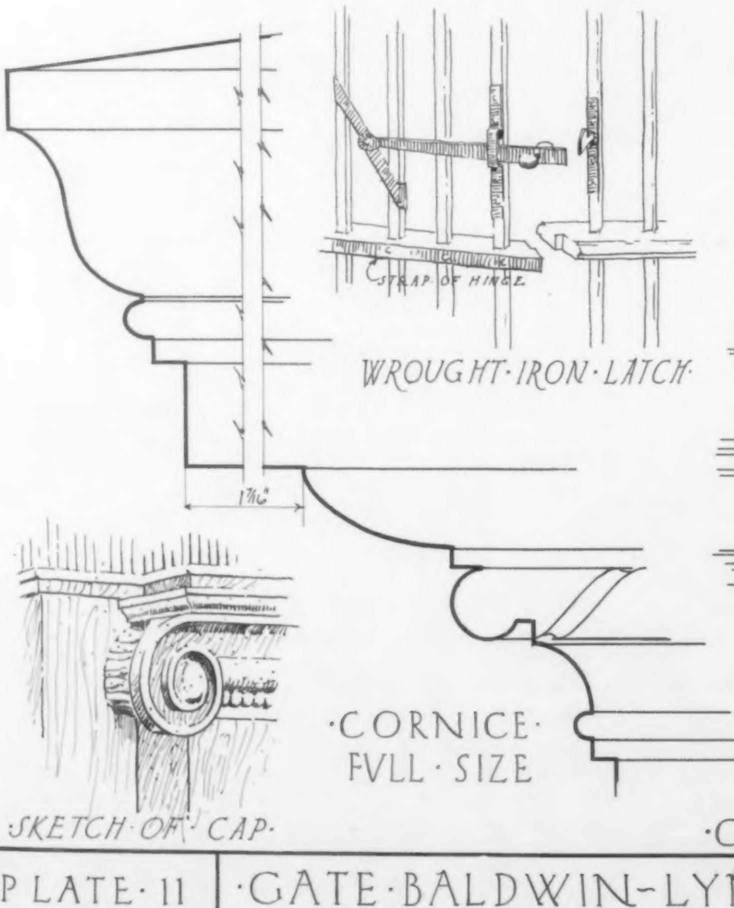
GATE AND POSTS, BALDWIN-LYMAN HOUSE, SALEM, MASS.
BUILT IN 1808

MEASURED AND DRAWN BY GORDON ROBB

Plate Eleven



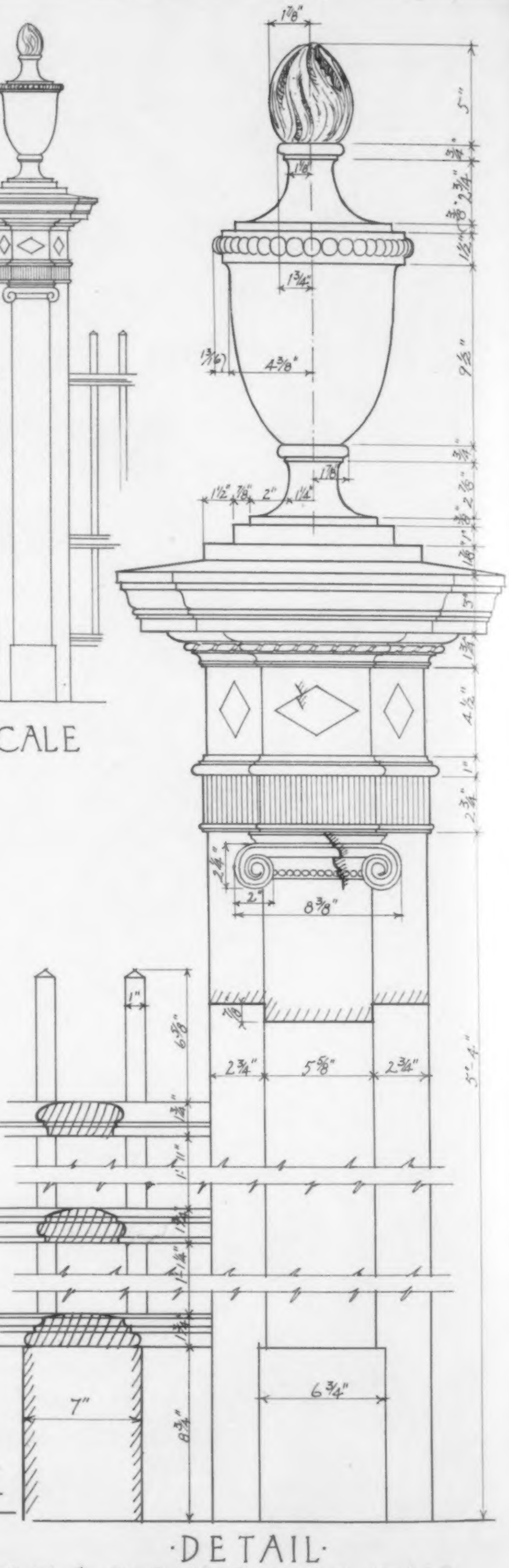
FRONT·ELEVATION·ONE·HALF·INCH·SCALE



WROUGHT·IRON·LATCH·

·CORNICE·
FULL·SIZE

·SKETCH·OF·CAP·



·DETAIL·
·ONE·&·ONE·HALF·INCH·SCALE·

PLATE·11 NOVEMBER·1915	·GATE·BALDWIN-LYMAN·HOUSE ·DATE·1808· ·SALEM·MASS·	MEASURED·&· DRAWN·BY· GORDON·ROBB·

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ENTRANCE DETAIL, ESCUELAS MENORES, SALAMANCA, SPAIN

ERECTED IN THE XVTH CENTURY